THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

Vol. XXXVI. No. 897.] LONDON, JULY 20, 1880. [32nd Year. Price 6d.

GAS PURIFICATION
BY
OXIDE OF IRON.

COOKE BROS.,
CENTRAL DEPÔTS:
CO. DONEGAL, IRELAND;
LONDON DEPÔT:
ERITH,
OFFICES:
2, CROSBY SQUARE,
LONDON, E.C.

GENUINE TORBAY PAINT
And SPECIAL GASOMETER PAINT.
Several Prize Medals. Established over 20 Years.
These Paints are now used by all the London Gas Companies and most of the principal Country Gas Companies, on Gas-holders, Scrubbers, Purifiers, &c. Also used by the Admiralty, War Office, Railway Companies, Founders, &c. They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations; do not crack, blister, or flake off; will cover tar effectually.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
Supplied, mixed ready for use, or in paste, as desired.
TORBAY PAINT COMPANY.
Proprietors: STEVENS & CO.,
21, GREAT WINCHESTER STREET, LONDON
Works: BRIXHAM, TORBAY.

TUBES.
Tubes and Fittings for Gas, Steam, Water, and Hydraulic purposes, plain, galvanized, white enamelled inside, or coated by Dr. Angus Smith's process, or oxidized by Professor Barff's patent process. Gas-fitters tools, brass cocks, &c.
JOHN SPENCER,
VULCAN TUBE WORKS,
WEST BROMWICH, STAFFORDSHIRE,
AND
97, CANNON STREET, LONDON.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a Prize Medal was awarded at the Great Exhibition of 1851, for "Gas-Retorts and other Objects in Fire-Clay," and they were also awarded at the International Exhibition of 1862, the Prize Medal for "Gas-Retorts, Fire-Bricks, &c., for Excellence of Quality."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpieces, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
Jos. Cowen & Co. are the only Manufacturers of Fire-Bricks and Clay Retorts at Blaydon Burn.

JOHN RUSSELL & CO.,
LIMITED,
Established at the commencement of Gas Lighting,
Manufacturers of
TUBES AND FITTINGS.
THREE PRIZE MEDALS,
Paris, 1878.
Head London Office:
145, QUEEN VICTORIA STREET.
ALMA TUBE-WORKS, WALSALL;
OLD PATENT TUBE-WORKS, WEDNESBURY.

JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
Manufacturers of
WET AND DRY GAS-METERS,
Licensees and Manufacturers of
HUNT'S
PATENT COMPENSATING METERS,
STREET-LAMPS, &c., &c.
Established 1830.

THOMAS PIGGOTT & CO.,
SPRING HILL, BIRMINGHAM,
Manufacturers of
TELESCOPIC & SINGLE GASHOLDERS
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
Sugar, Saltpetre, and all kinds of Pans.
Roofs, Girders, and Bridges, and General Smith's Work
London Offices: 97, CANNON STREET—
JAMES E. & SAMUEL SPENCER, Agents.

THE
"OTTO" GAS-ENGINE,
From ½ to 40 H.P. ind.
See Page 86.

CROSSLEY BROTHERS,
MANCHESTER AND LONDON.

THE
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.
AGENT:
JAMES M'KELVIE,
HAYMARKET,
EDINBURGH.
ESTABLISHED 1840.

GEORGE GLOVER AND CO.,
PATENTEES OF THE
NATIONAL STANDARD GASOMETERS
AND MANUFACTURERS OF
IMPROVED DRY GAS-METERS.
GOLD MEDAL. HIGHEST AWARD.

INTERNATIONAL EXHIBITION,
SYDNEY, 1880.
RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.
1, LANCASTER AVENUE, MANCHESTER.
Foreign Agents: DAHL BROS., Copenhagen; A. FAAS & CO., Frankfort-on-Maine; W. HOVEN & SON, Rotterdam; COPLAND & M'LAREN, Montreal; A. DEMPSTER, 57, Elizabeth Street, Melbourne.

WELLINGTON TUBE WORKS,

GREAT BRIDGE, TIPTON, STAFFORDSHIRE.

JOSEPH AIRD,

GAS, STEAM, AND HYDRAULIC TUBES AND FITTINGS.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER AND BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM (Established 1765),

MANUFACTURER OF

TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST-IRON TANKS FOR DITTO.

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, AND ALL KINDS OF GAS APPARATUS.

WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.

STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

AND ALL KINDS OF WROUGHT-IRON WORK.

Drawings, Specifications, and Estimates supplied on application.

GOLDSMITH'S PATENT SIGHT WATER-LINE INDICATING GAS-METER.

MANUFACTURED BY GUEST AND CHRIMES,

FOUNDRY AND GENERAL BRASS WORKS,

ROTHERHAM;

AND 85, SOUTHWARK ST., LONDON, S.E.

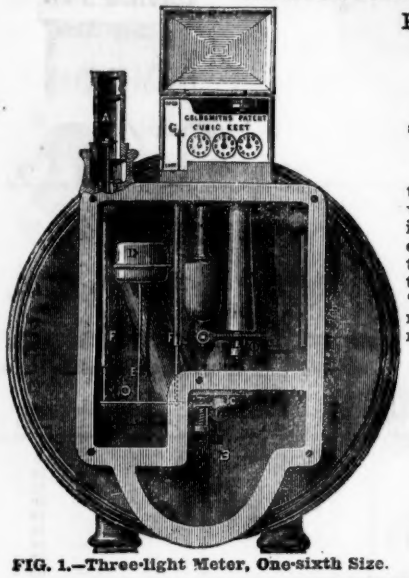


FIG. 1.—Three-light Meter, One-sixth Size.

Fig. 1 is a Meter with front removed to show the arrangement and connection of the Indicator and Valve.

Fig. 2 is front view of Index, with cover up.

The principal object of this invention is to render the water-line in the reservoir at all times visible. It will be seen, by reference to the illustrations, that this is accomplished in the following manner:—On the dial are the words "Open" and "Shut," and attached to the float is the pointer G, which rises and falls with the water-line in the reservoir. If the pointer is at "Open," it shows that the valve is open, and that the reservoir is full. If it is at "Shut," it shows that the reservoir is empty, and that the gas will be shut off.

The following ADVANTAGES will be obvious:—

1. The Inspector can see at a glance if the Meter requires water.
2. No more water than is required need be added, and therefore no water has to run out.
3. The Meter Inspector will be spared a great deal of his most objectionable work, and he will save a great deal of time and trouble.
4. The consumer will not always have to be asked for water, nor will he have to endure the unpleasant smell caused by waste water being run out.

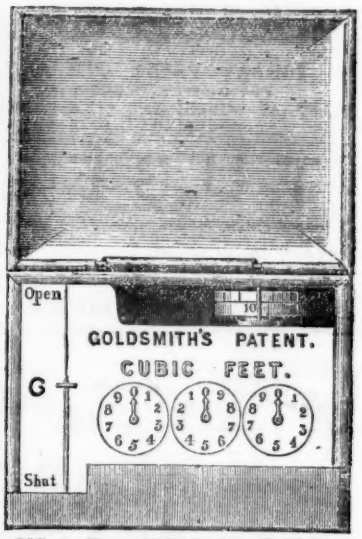


FIG. 2.—Three-light Index, Half Size.

TRADE MARK.

THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

CROWN TUBE-WORKS,

WEDNESBURY, STAFFORDSHIRE.

WAREHOUSE: SOUTHWARK STREET, LONDON.

JAMES RUSSELL & SONS, LIMITED,

PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

MANUFACTURERS OF

TUBES and FITTINGS for GAS, STEAM, and WATER;

LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;

HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.,

GAS-FITTERS TOOLS, VALVES, COCKS, &c.

THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM.

MANUFACTURERS OF

TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

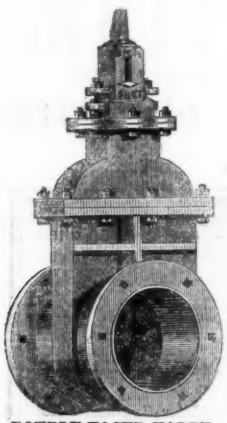
By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

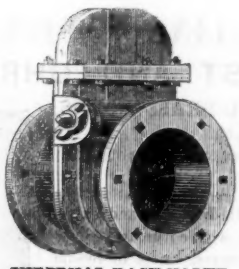
Drawings, Specifications, and Estimates supplied on application.

LONDON OFFICES. 47, CANNON STREET—JAMES E. & SAMUEL SPENCER, AGENTS.

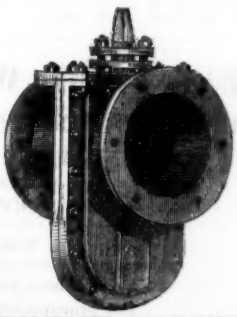
C. & W. WALKERS' GAS-VALVES.



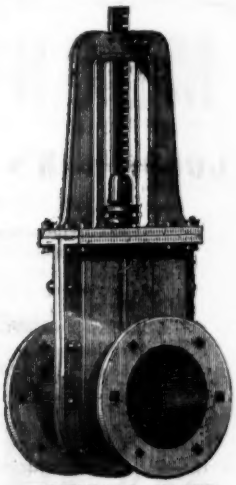
DOUBLE-FACED VALVE SPECIALLY FOR PURIFIERS.



INTERNAL RACK-VALVE WITH STEEL PINION, FOR GENERAL USE.



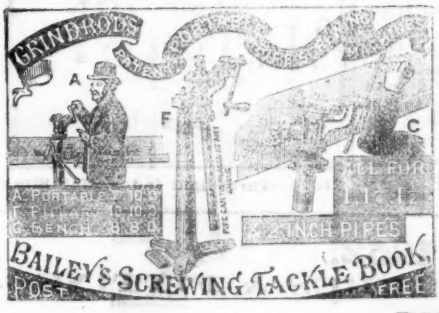
UNDERGROUND SCREW-VALVE FOR SHALLOW STREET-MAINS.



ORDINARY RACK AND PINION VALVE.

MIDLAND IRON-WORKS,

DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.



BAILEY'S FLY WHEEL STEAM PUMPS
SIMPLE & STRONG,
WITH NO MYSTERIOUS VALVES.
W. H. BAILEY & Co. HYDRAULIC ENGINEERS,
ALBION WORKS, SALFORD, MANCHESTER.

Prices of Bailey's Double-Acting Steam-Pumps.

No.	Diameter of Steam Cylinder.	Diameter of Pump.	Length of Stroke.	Gallons pr. Hour. Approx.	Price.
	Inches.	Inches.	Inches.	At Slow Speed.	£
A 1	4	2	6	850	18
B 2	6	3	10	1,940	25
C 3	6	4	10	2,000	30
D 4	8	4	10	3,150	40
E 5	6	6	10	7,200	40
F 6	8	6	10	7,200	50
G 7	10	6	12	7,200	60
H 8	8	8	10	14,000	65
I 9	10	8	12	14,000	75
K 10	12	8	15	14,600	90
	10	10	15	21,000	110
	12	10	15	21,000	125

NOTE.—*At quick speed these pumps will generally deliver double the quantity specified.*

BAILEY'S HOT-AIR ENGINES,

From ¼-horse to 4-horse Power. Particulars on application. We also make Hot-Air Pumping Engines, and every description of Hydraulic Work.

W. H. BAILEY & CO., ALBION WORKS, SALFORD, MANCHESTER.

ROBT. DEMPSTER & SONS,

GAS ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,

ROSE MOUNT IRON-WORKS, ELLAND, YORKSHIRE.

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS;

CONTRACTORS FOR THE

ERECTION OF PUBLIC AND PRIVATE GAS-WORKS.

Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.

GAS PURIFICATION

BY

OXIDE OF IRON.

GAS PURIFICATION & CHEMICAL Co., LIMITED

PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

JOHN WM. O'NEILL, Managing Director.

GAS *v.* ELECTRIC LIGHT.

WIGHAM'S PATENT LIGHTHOUSE GAS-BURNERS,

For Street Lighting and the Illumination of Large Halls, Factories, Ship Yards, &c., where Powerful Light is required

These Burners have been adopted by a School Board, having large school-rooms in charge, because of their high illuminating power and the facilities they give for perfect ventilation. The actinic power of these Burners is such that they are used successfully for Photography and Photo-Lithography.

SOLE MANUFACTURERS:

J. EDMUNDSON & CO., Gas Engineers, 19, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

MECHANICAL CONDENSATION.

The undersigned has arranged with Messrs. Pelouze and Audouin the exclusive agency for their patented system of Condensation, in Great Britain and the Colonies.

The following are some of the advantages which this philosophic mode of arresting liquefiable vapours possesses:—

1. It acts irrespective of temperature.
2. It requires no motive power, but automatically adapts itself to production.
3. It may be fixed directly after the hydraulic main, by which prolonged contact of the gas with tar is avoided, and the highest standard of illuminating power is obtained which the coal is capable of giving; or it may be fixed directly after an ordinary air condenser, when it will arrest the vapoury globules which cooling alone will not stop, and the production of tar and ammonia water is thereby increased.
4. It effects a considerable saving in purification, through no tar getting to the material to clog its action.
5. It entirely supersedes the necessity of scrubbers; and if wet sawdust be used in a purifier, washers also are unnecessary.
6. It occupies but little space, and avoids that which is now considered a disadvantage—the too much cooling, scrubbing, and washing of gas.

Further particulars may be obtained of

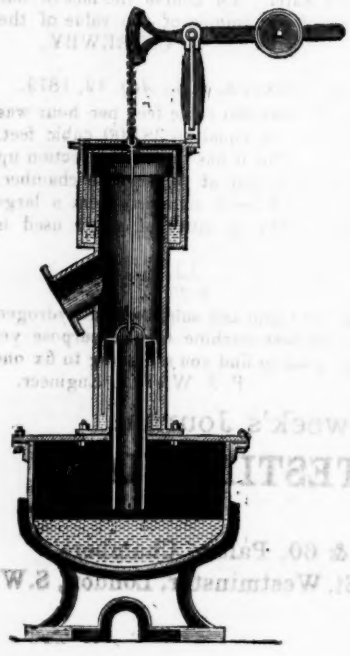
GEO. BOWER, St. Neots, Hunts.

NOTE.—*Gas-works contracted for complete, or apparatus supplied in detail from the retort to the burner.* "*The Gas and Water Engineer's Book of Reference,*" *post free,* 5s. "*Handy Abstract of the Public Health Act,* 1875," *post free,* 1s.

SELF-ACTING REMOVABLE DIP-PIPE,

PATENTED BY

CHANDLER & STEVENSON.



The following Testimonials, as to five years constant working of this Patent Removable Dip, have been received:—

Metropolitan District Asylum Gas-Works, Caterham, Surrey, Jan. 15, 1874.

Messrs. CHANDLER and SONS.

DEAR SIRS,

In reply to your inquiries, I beg to inform you that since I have used your Patented Dips (ten in number), I find my make has increased over 1000 cubic feet per ton of coal carbonized, my usual make being 9070 cubic feet before using your Dips, and 10,150 cubic feet since using them.

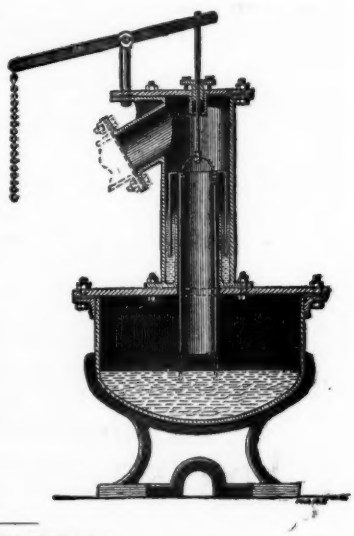
Metropolitan District Asylum Gas-Works, Caterham, Surrey, Dec. 30, 1879.

Messrs. CHANDLER and SONS.

DEAR SIRS,

In reply to your inquiry, it is with very much pleasure thatI endorse every word of my letter of Jan. 15, 1874; and I may add that from the date the Patent Dips were fitted, they have worked perfectly, and there is very little carbon deposited in the retorts, in consequence of the lower pressure.

Yours faithfully,
(Signed) W. CRICKMAY,
Memb. Soc. Engineers.



APPLICATIONS TO BE MADE TO

Messrs. CHANDLER & SONS,

104, NEWINGTON CAUSEWAY, S.E.

KIRKHAM, HULETT, & CHANDLER, LIMITED.

PATENT "STANDARD" WASHER-SCRUBBER,

FOR

GAS PURIFICATION,

TAKES OUT EVERY TRACE OF AMMONIA AND A LARGE QUANTITY OF CARBONIC ACID AND SULPHURETTED HYDROGEN BY ONCE PASSING THROUGH THE MACHINE.

AMMONIACAL LIQUOR OBTAINED OF ANY REQUIRED STRENGTH.

The Cost of the Machine defrayed by the Ammonia obtained in Twelve Months.

It requires very little attention, and cannot get out of order.

These Machines, which contain from 3200 feet to 65,000 feet of Wetted Surface, are supplied to the following Gas-Works:—

	Feet per Day.
The Gaslight Company, London—	
Beckton	5,000,000
Bromley	7,000,000
St. Pancras	3,000,000
Bradford Corporation	1,000,000
Bremen	150,000
Buxton Local Board	250,000
Dukinfield Local Board	500,000
Driffield Company	100,000
Goole Company	250,000
Glossop Company	300,000
Holywood Company	125,000
Heywood Local Board	600,000
Leeds Corporation	2,000,000
Leominster Company	150,000
Maidstone Company	1,000,000
Phœnix Company, Greenwich	2,500,000
„ „ Vauxhall	3,000,000
Woolwich Equitable Company	400,000
Yeadon Company	500,000

And many in course of Construction, among others—

Feet per Day each.	For
Four for 3,000,000	Corporation of Leeds.
Three „ 1,750,000	Corporation of Salford. [Station.
One „ 2,500,000	The Gaslight Co., Shoreditch
Two „ 1,250,000	The Gaslight Company, Beckton.
One „ 3,000,000	London Gas Co., Nine Elms.
One „ 1,250,000	Corporation of Nottingham.
One „ 2,000,000	Cheltenham Gas Company.
One for 1,000,000	West Bromwich Improvement [Commissioners.
One „ 750,000	Radcliffe and Pilkington Gas Co.
One „ 500,000	Oldbury Local Board.
One „ 150,000	Falmouth Gas Company.
One „ 250,000	European Gas Company, Rouen
One „ 200,000	Deal Gas Company.

TESTIMONIALS.

Messrs. KIRKHAM and HERSEY. *The Gaslight and Coke Company, Beckton, North Woolwich, June* 8, 1880.

Gentlemen,—I enclose you some particulars of the working of your Washers here, and I intend having some more experiments made, as just now we are working the first Washer with liquor, and the second with water. Of course the fact of our having ordered two more in addition to the four which we have in use is a sufficient indication of my opinion of the value of the Washer.

(Signed) G. C. TREWBY.

Messrs. KIRKHAM and HERSEY. *Phœnix Gaslight and Coke Company, Office, Greenwich, S.E., Aug.* 12, 1879.

Gentlemen,—In reply to your inquiry, one of your Patent Scrubber-Washers to purify 100,000 cubic feet per hour was put into operation at these works on the 1st of June. At the same moment the whole of our Scrubbers, equal to 28,000 cubic feet, were thrown out of use, leaving your Washer the whole work of freeing the gas from Ammonia. This it has done to perfection up to date. With 10 gallons of water to each ton of coal carbonized passing through it we get a clean test at the seventh chamber, leaving four chambers margin for extra work. The mean quantity of Ammonia in the inlet (fixed and free), obtained from a large number of tests, was 241 grains per 100 feet of gas. On the outlet—Free Ammonia—Nil. The quantity of water used is 10 gallons per ton of coal carbonized. The strength of liquor as follows:—

Chamber No.	1	2	3	4	5	6	7	8	9	10	11
Strength of liquor—ounces	Nil.	Nil.	Nil.	Nil.	0·4	1·0	2·2	3·5	5·5	8·25	12·5

We are working five revolutions per minute. It takes out all the free Ammonia, reduces the carbonic acid and sulphuretted hydrogen 30 per cent., requires a very small amount of power to drive, and altogether is, in my opinion, the best machine for the purpose yet invented, and will, I feel confident, ere long, entirely supersede the Scrubbers of to-day. I am glad to find you are going to fix one of these Washers at our Vauxhall works.

(Signed) P. J. WATES, Engineer.

For Results and other Testimonials, see next week's Journal.

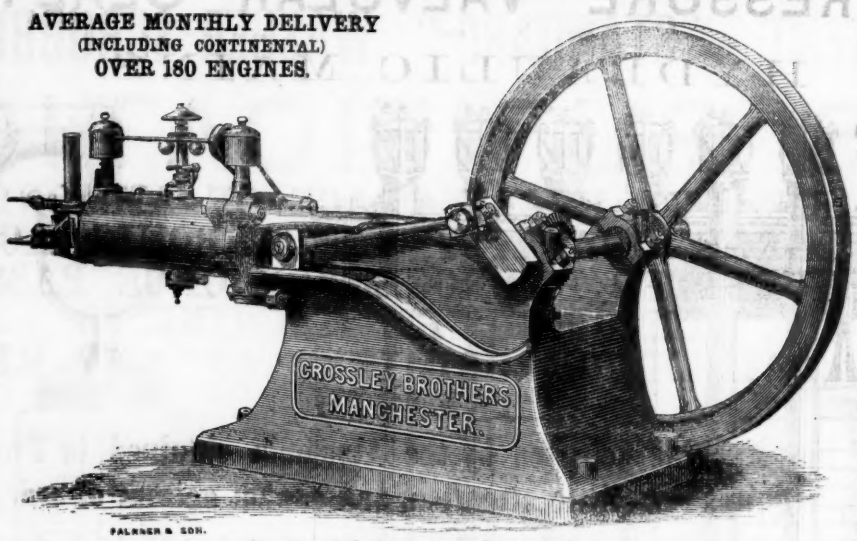
FOR FURTHER PARTICULARS AND TESTIMONIALS, ADDRESS MESSRS.

KIRKHAM, HULETT, & CHANDLER, LIMITED, { 59 & 60, Palace Chambers, Bridge St. Westminster, London, S.W.

AN ENGINE WHICH WORKS WITHOUT A BOILER OR STEAM.

These Engines are used at the following Gas-Works:—Birmingham, Brentford, Bucharest, Bishop Stortford, Driffield, Dundalk, Dundee, Dublin, Huddersfield, Hinckley. London—London Gas-Works, Phœnix Gas Co., Gaslight and Coke Co., South Metropolitan Gas Co., Commercial Gas Co., Crystal Palace District. Leominster, Edinburgh and Leith, Ludlow Union, Lancaster, Maidstone, Nuneaton, Northampton, Shanghai, Sheffield, Worcester, Wantage, &c.

AVERAGE MONTHLY DELIVERY
(INCLUDING CONTINENTAL)
OVER 180 ENGINES.



PALMER & SON.

Over 2500 already delivered.

Very numerous Testimonials from Users, including Engineers, Men of Science, and others, on application to the makers.

No trouble with Coal, Ashes, Smoke, Insurance, Water, or constant attendance.

No Glands to pack, or Water Gauges and Steam Gauges to watch.

STARTS AT A MOMENT'S NOTICE.

THE "OTTO" SILENT GAS-ENGINE,

From ½ to 40 Horse Power Indicated.

(Otto and Crossley's Patents, 1876 and 1877.)

THEY ARE USED FOR ALL KINDS OF PURPOSES, CHIEFLY FOR EXHAUSTERS, SCRUBBERS, & PUMPS.

DELIVERED IN MANCHESTER. CASES NOT CHARGED IF RETURNED FREE.

PRICES INCLUDE CAST-IRON STAND, TURNED FLY-WHEEL, AND DRIVING PULLEY; WATER-VESSEL, SEVERAL DUPLICATES, AND GAS-FITTINGS (EXCEPTING METER AND PIPES).

WORKS AND HEAD OFFICES:
Gt. Marlbro' St., Gloster St.

CROSSLEY BROTHERS,
MANCHESTER.

LONDON HOUSE:
116, Queen Victoria St., E.C.

EDWARD E. CROMBIE & CO.,

INVENTORS AND PATENTEES

OF THE

FRICTIONLESS DRY GAS-METERS,

Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

METROPOLITAN WORKS, DIANA PLACE, EUSTON ROAD, LONDON, N.W.

PARIS EXHIBITION,
1878.

THREE MEDALS
AND
HONOURABLE MENTION
HAVE BEEN AWARDED TO
JOSEPH CLIFF & SONS

For their Various Exhibits, amongst which is a

SILVER MEDAL
FOR THEIR
PATENT MACHINE-MADE
RETORTS AND FIRE-BRICKS,

Being the Highest Honour given for this class.

Established

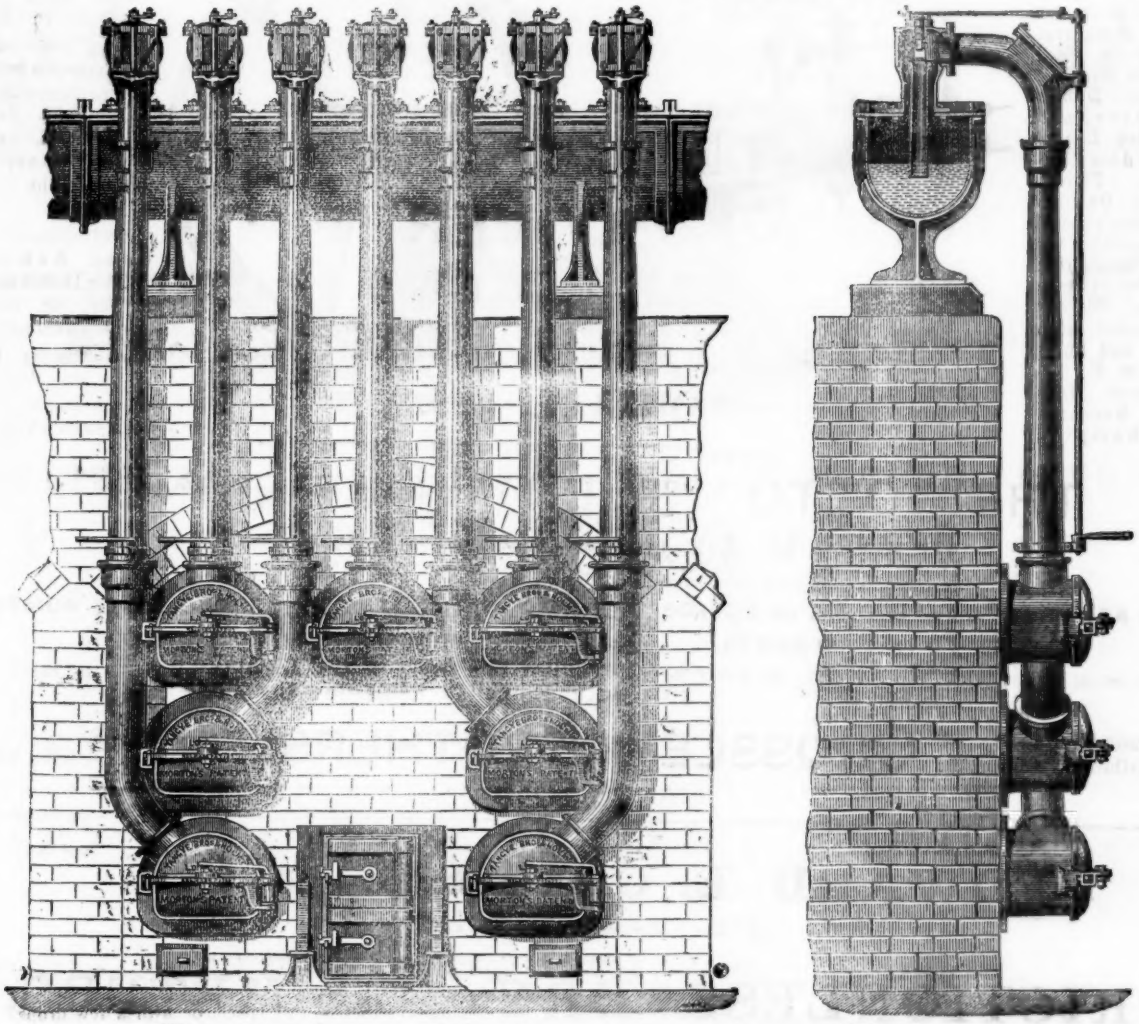
1795.

JOSEPH CLIFF & SONS,
THE ORIGINAL
WORTLEY FIRE-BRICK WORKS,
NEAR LEEDS,

London Wharf: No. 4 inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

HOLMAN'S PATENT
NON-PRESSURE VALVULAR SEAL-PIPES
FOR
HYDRAULIC MAINS.



The salient features of the above arrangement are as follows:—

1. The Seal is instantaneously opened and closed from the stage by the stokers.
2. There are only two positions for the actuating lever: one when the Seal is opened during the period of carbonization, the other when it is closed for drawing and charging the retort.
3. The retort can never be blocked, beause the port directing the gas *through* the Seal is always opened, and the port permitting the gas to *pass* the Seal *direct* into the hydraulic main is also open while the retort is at work.
4. The manager and stokers can always see at a glance, by the position of the lever, whether the retort is duly unsealed while carbonizing its charge.
5. There are no extraneous seals, stuffing-boxes, hinges, screws, chains, pulleys, springs, teeth, or other complication belonging to the valves; they are made plain and strong for rough use, and will last many years without renewal.
6. The valve faces are always covered and never separated, hence no foreign matter can put them out of action.
7. They are positive, reliable, interchangeable, free from all the uncertainty of automatic arrangements, and low in price.
8. No extra pipes or connections are required, because the Valvular Seal-pipe is self-contained in the single branch of the ascension-pipe, which stands on the hydraulic main, and is easily accessible by removing an ordinary cover secured by two bolts only.

(238) TWO HUNDRED AND THIRTY-EIGHT HOLMAN'S PATENT VALVULAR SEAL-PIPES are being fitted to the Hydraulic Mains at the Radford Station of the Corporation Gas-Works at Nottingham.

(84) EIGHTY-FOUR more are being fitted to the Mains in the New Retort-House of the Gas-Works at Brentford, and they can be readily applied to existing Hydraulic Mains generally.

They are to be fitted to the Hydraulic Mains of the New Retort-House at the LONDON GAS-WORKS, and at other large stations.

Mr. MORTON writes in the following terms, under date of Feb. 3, 1880:—

"Gentlemen,—I have determined to use your HOLMAN'S PATENT NON-PRESSURE VALVULAR SEAL-PIPES in our new Retort-House. Will you, in the meantime, send me, as soon as you can, four as you are now making them. I expect to hear of a large demand for these Pipes. I like the idea of always maintaining a passage through an ordinary dip."

ESTIMATES for Retort Work, including Mouthpieces fitted with Morton's Patent Self-Sealing Lids and Holman's Self-Sustaining Cross-Bars and Fastenings, Hydraulic Mains and Ascension-Pipes, fitted with Holman's Patent Non-Pressure Valvular Seal-Pipes complete (as per accompanying illustration), will be forwarded to Engineers on receipt of particulars of intended erections, or re-setting of Retorts during the current or ensuing season.

Engineers preparing Specifications will be furnished with Tracings and all necessary data on application.

Sole Makers:

TANGYE BROTHERS AND HOLMAN,
HYDRAULIC AND GAS ENGINEERS,
CORNWALL HOUSE, QUEEN VICTORIA STREET, LONDON, E.C.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters bv the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

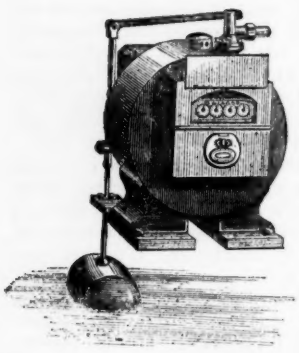
LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS.

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON AND CO.

(ESTABLISHED 1816.)



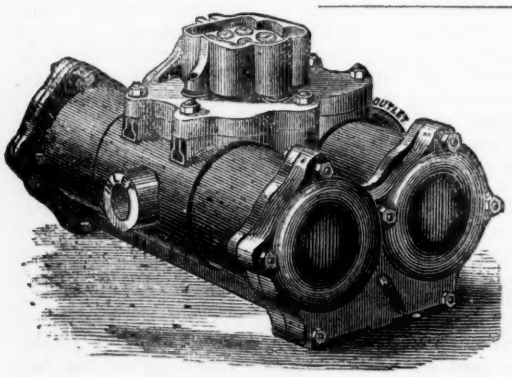
LOW-PRESSURE WATER-METER.

This Meter will register with perfect accuracy, either at full speed, or with a few drops only passing through it.

It must be placed over the cistern to be supplied, and the water, after being measured, will fall from the outlet into the cistern below.

Each Meter is fitted with a ball-valve, so made that it can be adjusted to shut off the supply a the inlet when the water reaches any required height in the cistern.

The 100-gallon Meter is fitted with a cistern holding about three or four gallons, and may be fixed inside a house, free from the effects of frost, and requires no attention after once being fixed.



HIGH-PRESSURE WATER-METER.

The Union Water-Meter, of which an external view is here given, is of the positive class—*i.e.*, a Meter in which a measuring chamber is alternately filled and emptied, each filling being duly recorded. It is formed of two cylinders, with double pistons in each, having a rotary-valve of peculiar construction, which is worked from cams on the piston-rods.

It is claimed for this Meter, among its advantages over other Piston Meters in use, that it is extremely small and compact, and that its durability and accuracy have been proved by the fact that upwards of 20,000 of them, of various sizes, are in successful operation in the States. In England the instrument has been fully tested by several Water Engineers of eminence, and pronounced by them as a reliable and satisfactory register of water supply; it is also economical in cost.

ALL METERS are TESTED with 60 lbs. pressure before they are sent out.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

W. B.—*The Company have no remedy against the consumers. They might, under section 18 of the Gas-Works Clauses Act, 1871, have taken security for "the safety and return" of the meter; but not having done so, cannot claim its value.*

A. A. C.—*Received.*

W. L. C.—*In Messrs. Michael and Wills's book, "The Law relating to Gas and Water," the question you mention is dealt with in the introduction (second edition, p. 34), where, when speaking of non-statutory gas companies, the authors state that "every opening of the roads or streets is a nuisance at common law, and the company or proprietor may be proceeded against by indictment for every such offence;" and continue: "Neither can any public body in whom is vested the charge of streets and roads give such permission as will obviate the liability to proceedings against the proprietors. But it has been held by the Court of Queen's Bench that it is not illegal to grant to a gas company a licence to break up the streets, and that such breaking up is not necessarily a nuisance. It may now be taken as settled that the High Court of Justice will not grant an injunction to restrain a company without parliamentary status from opening the streets to lay mains and service-pipes to supply gas to a town; but the common law liability to proceedings cannot be avoided without parliamentary sanction for the works."*

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

TO SUBSCRIBERS.

Subscribers who desire to avail themselves of the reduction in the subscription to the JOURNAL by paying in advance for the second half of the year 1880, are reminded that this can only be done during the present month.

Subscribers who have not paid their subscriptions for this, or for any previous year, are requested to remit the same forthwith to the Publisher, in order to prevent any interruption in the regular delivery of the JOURNAL.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JULY 20, 1880.

Circular to Gas Companies.

THE inquiry into the cause or causes of the recent explosion in Tottenham Court Road was completed on Tuesday last, and all that will be known on the matter is now before the public. We are obliged to express our regret and disappointment at the manner in which the case has been investigated, and at what we regard as the unsatisfactory conclusion reached. An inquiry into an occurrence which is without precedent, and which involves the necessity for some technical and scientific knowledge, is clearly not happily placed in the hands of a coroner's jury, even when its members are prepared to give unlimited time to the pursuing of it. When, however, as in this case, there are repeated intimations of an impatient desire to come to a conclusion at the earliest possible moment, the chances of a satisfactory issue are still more remote. Had the coroner's inquiry been confined to the mere ascertaining and certifying of the cause of the deaths, and some man of suitable experience and training—say Mr. Vernon Harcourt—been entrusted with the scientific investigation of the explosion itself and its causes, there would have been almost a certainty that those causes would have been marked out with accuracy. We should thus have had the one satisfaction possible from so melancholy a circumstance—it would have served as a beacon to save others from like catastrophes in the future. As it is, the public are asked to believe that this most sad and terrifying occurrence is one which those who should know most on the matter are quite unable to explain; that its cause is a mystery impossible of determination in this case, and therefore beyond the possibility of providing against for the future; and consequently that, so long as they cannot dispense with the use of gas, they must be prepared for a repetition of such scenes as have been recently witnessed. As remarked last week, not the least of the evils resulting from the disaster is the feeling of vague alarm which it has created in the minds of a large number of people—an alarm which Gas Companies have no right, even if they can afford, to disregard. We hold that every effort should be made to remove this erroneous idea of danger, and therefore repeat our regret that the inquiry did not establish beyond doubt the cause of the accident, and so afford an assurance that it would not recur.

It will be seen from the report we publish this week of the evidence given at the adjourned inquest, that the theory suggested by the Gas Company on the first day, although not abandoned in so many words, was really surrendered. This theory was that gas which had escaped from one or other of the small pipes in the streets traversed by the large main, saturating the loose earth under the paving, had found its way into the new main through a fracture in one of the lengths. We remarked in our last "Circular" that the probabilities were against this theory, but anticipated that it had some foundation in facts known to the Company's officers, of which evidence would have been forthcoming. As no such evidence was furnished, we assume that it did not exist, and that this idea was put forward only because of the unwillingness of those who suggested it to believe in the possibility of the valve leaking. Probabilities were, on several grounds, against the suggestion. Considerable as is the waste from gas-mains occasionally, they are usually soon discovered and made good, especially when the attention of the Company's officers is being directed day after day to the particular neighbourhood of the escape. The smaller service-mains are generally at a less depth than the large trunk-mains, and the escaping gas would be more likely to find its way up through the pavement than to go down in search of another outlet. Again, a fracture in a pipe proved as these were is almost impossible, except at one of its extremities. A split at the plain end would have been seen by the workmen, and the main rejected, and if a socket had been opened in setting up, even if it had been passed by workmen, foreman, and inspector, the lead and yarn of the joint would leave very little room indeed for the ingress of gas, although backed (as it could not have been in this case) by some pressure. It would, in our opinion, have been better, as this theory, hastily put forward, could not be supported, that it should have been withdrawn. At the time it was being considered there lay a main three times the length of that in which the explosion took place, and of the same large size, extending, as we explained last week, from Tottenham Court Road to Goswell Road, still charged with air, because gas had not yet been turned into it. That no apprehension of danger was felt in reference to this main is a proof that no strong faith was felt in the theory. Had it been well founded, Gas Companies would have been guilty of criminal carelessness henceforth, if, in laying new mains, they had not from day to day blown out the air from the length completed, letting the gas follow up the workmen as they proceeded. We have felt it necessary to dwell on this suggested explanation of the accident, because of the source from which it came, and also because it is the only alternative to that which the jury, we believe rightly, found to be the true cause—the passage of gas through the valve.

The evidence given as to the proving of the main showed that while it was sound enough to warrant the Chief Inspector in accepting it as practically perfect, it was not

so sound as the other section was reported to be. We mentioned last week how small was the quantity of gas—less than one foot per hour—which needed to find its way into the main to form the explosive mixture, and there is nothing in the report of the proving to make us doubt that the valve let pass to this extent. We need hardly remark that a very much smaller opening or leakage in the valve would suffice than would be required in the main itself. The former would pass, uninterruptedly, a quantity of gas varying only with the pressure in the live main; in the other case, an opening which would let in enough gas in the fitful way that would be alone possible, and without pressure behind it, would have let out so much of the air pumped in as to have made it impossible to pass the main as satisfactorily finished.

The lesson to be learned from this unfortunate occurrence is a very clear one. It is not right to trust to any valves as absolutely sound when used in the public streets. This was clearly Mr. Hersey's opinion when, having fixed the valve in question, and laid a few pipes across the street in which it was placed, he removed the men to the other extremity, and laid the main back towards the valve. It was also the opinion of the foreman, Hawkes, who tested the new main with a light, contrary to custom, and "as a precaution," although he knew that no gas had been let into it. Had the two sections of the main been completed at the same time, and the connection made, or had the coupling of the short length from the valve in Howland Street with the section completed in May, been delayed until the whole was finished in July, no harm would have ensued, and this sad experience would not have been gained. If it was necessary to join up to the valve so long before the main was to be put into use, then the event has proved that it would have been better to blow out the air from that section at once, and make the final connection in Bayley Street with gas in the pipe. Our desire in these observations has been to make clear, so far as we are able, what is, after all, a very simple circumstance, serious as were its consequences. We feel that no blame is attachable to any one concerned in the matter, and that our sympathy is due to Mr. Hersey and Messrs. Aird and Sons in the great pain and anxiety which it must have caused them. At the same time we hold that if, after the experience so sadly gained, a similar accident should again occur, nothing could relieve those engaged in the work from the gravest responsibility, except ignorance of the facts of this case.

The members of the Société Technique de l'Industrie du Gaz en France—the French equivalent for our British Association of Gas Managers—have just held their annual "congress," which was opened with a very interesting address by the President. M. Jordan, as stated by himself, is connected with the iron industry quite as deeply as with gas, and by virtue of his semi-independent position he claimed the right of being heard as an unprejudiced observer on the question of the continued existence and development of gas lighting, in view of the competition which at this time, more than ever, is forced upon it by its many rivals. The address, indeed, was chiefly concerned with this important subject, upon which the President's judgment was eminently calculated to reassure his hearers. But besides the vindication of those concerned in the manufacture of gas from the charges which the advocates of rival systems of lighting level against them, in France as elsewhere, there were portions of his address which offer much food for reflection to sympathizing and interested outsiders. For instance, in the allusions made to the various devices by which gas undertakings in France are made to yield revenue to the State and Local Authorities, we obtain instruction illustrative of the extraordinary propensity of the French bureaucracy for raising, by indirect and roundabout means, money which, by the way, they appear just as willing to expend in a similar manner, if we may judge from the latest proposal to subsidize French steamship owners, with the ulterior object of fostering a native merchant service. It gives one an impression that in following out this general idea of taxation, the French authorities hold the belief that money so raised comes into existence by some special creation, instead of out of the pockets of the people, and that they think the long-suffering trader is in ignorance of the extent to which he is victimized by his rulers, just because he cannot precisely tell how and where the money goes. We are the more inclined to form this opinion after reading the President's comments upon a proposal for levying a tax upon gasholders, at the rate of 20 centimes per cubic mètre capacity, irrespective of the tax payable on the gross value of all plant and utensils, and a separate rate on all mains and pipes which are laid under any public highway. Our own system of valuation for the relief of the poor is frequently oppressive, but it is at least final and comprehensive, and we are fast becoming strangers to the multitudinous and very shallow devices in taxation with which our Continental neighbours are yet afflicted. A complex organization such as a gas undertaking offers a ready field, in the multiplicity of its belongings, for experiments in that kind of taxation which is akin to the method of raising money known to the impecunious as "kite-flying;" but as long as Governments have to provide for vast expenditures without daring to ask the taxpayer openly for the revenue they require, we must expect to see continued manifestations of this peculiar description of misapplied ingenuity.

The Wolverhampton magistrates have recently had occasion to clear up a doubt which seems to have prevailed in that neighbourhood respecting the liability of carts loaded with refuse gas lime to pay toll on passing over turnpike roads. As it was not disputed that manure of any kind in transit for use in agriculture is exempt, it is difficult to see how such a well-known manure as foul lime could have been considered subject to toll by any one other than an over-officious gatekeeper. An effort was, however, made to show, in defence, that as lime is not always exempted from toll, the particular compound in question lay at least in debateable ground; but this ingenious contention was overruled on the broad commonsense principle that the material was in fact manure, and was only intended for use as such. Therefore the toll-gate keeper will interfere no more with the free transit of farmer's carts as they remove the rejected material of the purifiers of the Wolverhampton Gas-Works.

The Salford Town Council have been charged more than once of late with reckless extravagance in respect of certain proceedings to which they have committed themselves, notably in connection with the enclosure of open spaces, making new roads, and similar works, for which, as alleged, they are burdening the present generation of ratepayers for the prospective benefit of their descendants. So deeply has the sense of their excessive generosity in these matters sunk into the popular mind, if the local press is to be believed, that the next municipal elections will probably turn in favour of a new set of candidates pledged to "economy above all things." The growing discontent has already had some effect on a choice few of the present Councillors, who are apparently anxious to trim their sails to the rising breeze while there is yet time. Hence, the spending departments having drawn on themselves no little public odium, it is only natural Town Councillors logic to turn at once to the sole important source of profit possessed by the Corporation—the gas undertaking—and endeavour to effect a saving somewhere in connection with it. This was done, and in the present instance the chance of making a telling stroke of economy soon presented itself. The Salford works supply gas over a district of forty square miles, much of which is ill-provided with means of conveyance, and it is not surprising that the Engineer, who was expected to exercise personal supervision over this extensive area, demanded, when he first assumed his duties, the convenience of a "horse and trap." This, however, was denied to him; but cabs proving rather costly, the Gas Committee eventually made him an allowance for travelling expenses, leaving him the choice of conveyance. This is the outlay which has shocked the economic sensibilities of a few members of the Town Council. An undertaking returning a profit of over £40,000 per annum by operations conducted over a large area, cannot, it is said, bear an expenditure such as is necessarily incurred by a parish doctor. And the moment chosen for this exhibition of cheese-paring is the same which witnesses a reduction in the price of gas, still leaving a good margin of anticipated increased profit. And the manner in which it is endeavoured to show some appreciation of the services of the man who is officially responsible for keeping the concern on its legs, is to put him on his—by making him walk.

The statistics of the Oldham Corporation Gas-Works, of which we publish some extracts in another column, show a good margin of profit on the past year's working, almost the whole of the disposable balance, or a net sum of £13,500, having been added to the respectable amount previously taken from the gas profits and applied in aid of the rates. Much detailed information of a general character is given in the various accounts and tabular statements appended to the report; but, as in too many compilations of this kind, in a form which fails to give them the interest, as a means of comparison with results obtained elsewhere, which might have been secured with very little extra trouble. If the methods of analysis practised by Mr. Field with respect to the accounts of the Metropolitan Gas Companies, or by Mr. Lass, or even the more exhaustive reduction of groups of

facts into ratios and abstract data, as may be observed in many of the reports of Continental Gas Companies which we publish from time to time, were more generally copied by the accountants who prepare for publication the reports of our important provincial gas-works, a great benefit would be conferred on the members of the profession at large.

It is with surprise that we learn from some of the American papers that Mr. Edison's incandescent lamps, the wonderful carbon horseshoes of which we have heard so much, have actually been improved upon by another inventor—Mr. John H. Guest, of Brooklyn. There appears to be no room for doubt respecting the reality or value of the improvement, which consists in sealing the connecting wires in mercury at the point where they pass into the exhausted interior of the lamp, and so surmounting the difficulty which has troubled Mr. Edison, of air leaking in through cracks in the glass and spoiling the vacuum. This is very satisfactory so far, but how comes it that such a simple expedient was left to an outsider to introduce? This improvement, it is true, is not of such a character as to place the horseshoe lamp at once and for ever on the pinnacle of practical success, to do which, indeed, would require alterations of far greater sweep; but that an improvement, however small, should be possible upon anything emanating from Menlo Park, is another melancholy proof of human imperfection. The lesson is but an old one after all, but it is refreshing to be reminded of its truth, after the repeated efforts of newspaper correspondents and other (dis)interested witnesses to demonstrate that it did not apply to the case of the great inventor.

According to Mr. J. S. Sloane, M.I.C.E.I., late Engineer to the Commissioners of Irish Lights, the introduction of gas for the use of lighthouses is seriously hampered by the great disadvantage that the lenses designed for the old oil-lamp flames, which are also used for gas-flames, are not adapted for securing the best effects which the latter are capable of producing. It may well have been imagined that when the authorities who are charged with lighting our coast line decided to burn gas at some of their most important stations, they would have taken care to supplement the special burners constructed for that purpose with suitable lenses, in order that no part of the available illuminating power should be misdirected or lost; but it appears that this was not done, and, as a consequence, Mr. Sloane is of opinion that gas has not in this connection received full justice. No one, however, will be surprised to hear from the same authority that the electric light, when tried for lighthouse purposes, has had every encouragement that science and art can give to make it practically successful, although, after all, Mr. Sloane has only qualified praise to give to it. On the different grounds of reliability, clearness in foggy weather, steadiness, and economy, he contends that gas is infinitely preferable to the electric light for lighthouses, even with the unequal conditions under which the two systems have hitherto existed, while expressing himself as unable to imagine what would be the effect of the largest and most perfect gas-burners, if fitted with properly-prepared lenses. That such observations as these should be possible is anything but creditable to the authorities in question; and we may be absolved from the charge of contending for the interests of gas alone in expressing the hope that in all cases, whatever luminant may be employed in lighthouses, suitable apparatus for enabling the light to do its duty to the full may not be lacking. Mr. Sloane has described the principle on which he would construct lenses for gas-flames, and the feasibility of making appliances of this kind to meet any requirements is not disputed; so that, now the evil which has arisen from a perhaps inadvertent application of defective lenses to Mr. Wigham's burners has been publicly exposed, we may expect to see it remedied.

Ever since the development of the various manufacturing processes involved in the production of wrought iron, which resulted in the application of that material to the multitudinous uses with which it has been associated in modern times, efforts have been constantly made to remove one of the greatest practical drawbacks to its continuance in strength, utility, and beauty—namely, its tendency to rust. It is too well known that wrought iron is no sooner turned out of the manufacturer's hands than it begins to decay from this cause, and nothing hitherto discovered, by way of preventive treatment, during manufacture or after, has availed to thoroughly preserve it in its pristine state. Galvanizing with zinc has for long been a favourite device for protecting a certain class of wrought-iron goods; but its capabilities are limited, it is costly, and not always desirable. Platinizing has also been warmly advocated as far preferable to galvanizing for the same class of articles. And now the latest device, although one not particularly novel in principle, is that of coating iron with a film of its own magnetic oxide, which has been brought under general notice by Professor Barff and Mr. George Bower, of St. Neots. Although the same end is arrived at by the two systems followed by Professor Barff and Mr. Bower respectively, the means adopted in each are quite different. Barff's may be described in brief as a steam process, the oxidizing agent employed to produce the peculiar action before mentioned on the surface of the iron being superheated steam; while Bower's process consists in subjecting the iron to be coated to carbonic oxide flame, with an excess of hot air. In both cases the result is the formation of a thin film of magnetic oxide of iron, adherent to the wrought-iron articles subjected to treatment, and this film is not susceptible of deterioration or further change in presence of influences which would speedily destroy ordinary metallic iron. With the relative advantages of the two processes named we need not at present concern ourselves, for if the principle eventually meets with extended success, the survival of the fittest will be observed in this as in every other contest, and the system which is most reliable and the cheapest will be most successful. We may, however, state a few considerations on the general subject. In the first place, it will be observed that, as with galvanizing, there exists a great class of subjects to which the oxidizing process will not apply. Nothing, in short, that cannot be put into an oven can be treated by either a steam or a dry method of oxidation. The plates and bars for large iron structures may, indeed, be so treated, whenever there is no subsequent manipulation—such as hammering, welding, rivetting, and the like—to be gone through. When any rough usage of this kind is necessary, no method of previous surface treatment will avert rusting. Hence for gasholders, &c., it is to be feared that the paint-brush must still remain the grand preserver. But, of course, there is an enormous scope for the peroxide process, even if the bulkier subjects are excluded from its range, and in its proper field it may be found to yield results equal to the highest expectations of its friends.

Water and Sanitary Notes.

THE Select Committee on London Water Supply are to meet to-day to consider their report. Probably the document will not be finally settled until Friday, but it is not likely that there will be any delay beyond that period. The report itself can deal with only one phase of the question—namely, the provisional agreements. The evidence of witnesses and the speeches of counsel have been limited to that particular part of the inquiry, and only in this way have the Committee succeeded in getting to a stage at which they can present a report. It cannot be said that the Committee have fulfilled the terms of the reference made to them by the House, and the fact that they have not done so is mainly due to the mode of proceeding which has been marked out by their Chairman, Sir W. Harcourt. We are rather surprised to find the Chairman trying at the last to throw the responsibility of the defective evidence upon the parties who came before him. As a matter of fact, the inquiry has been limited to the examination of four witnesses—that is to say, Mr. E. J. Smith, Mr. Allen Stoneham, Lieut.-Col. Bolton, and Mr. Richardson. When Mr. Philbrick announced his intention of calling the last-named gentleman, who is Chairman of the Parliamentary Committee of the Metropolitan Board of Works, Sir W. Harcourt observed: "I hope, for the "present, you will confine yourself to the question of "the agreements. Any other question we may consider "hereafter." Nevertheless, we find Sir William saying to Mr. Philbrick on Friday last: "I left it to you to exercise a "discretion such as the Corporation of London exercised. It is "entirely for you. It is not for this Committee to exclude "evidence that you are prepared to press." The Chairman further observed: "I understood distinctly from Sir James "M'Garel Hogg that the Metropolitan Board of Works had "considered the matter, and that they did not propose to offer "further evidence; but if they take a different view now, it "will, of course, launch us into a very large inquiry." It is to be hoped the fact will not be lost sight of, that, if the subject had been fully investigated, there would have been this "very large inquiry." Whether it is possible to decide on the question of purchase without considering the practicability of an alternative scheme, is a point which may very well be raised. All we can expect from the Committee is a kind of negative result, declaring that the provisional agreements are not such as they can recommend for the approval of Parliament. In one aspect there may be something gained,

inasmuch as the provisional agreements will be swept out of the way, and there will be a *tabula rasa* on which to inscribe a new story. Sir W. Harcourt, we doubt not, will be glad of this clearance. Sir Richard Cross's bargains were not to his mind. They were things to be got rid of, and after what we must designate as a very limited inquiry, the scheme of the late Government is evidently destined to be rejected. Sir W. Harcourt was right in one respect. He pointed out that the last part of the reference to the Committee had relation to the nature and extent of the powers of the Water Companies to levy water rates and rents. "Now, that part of the reference to the Committee," said Sir William, "was drawn up specially with regard to a "memorial presented by the Corporation of London, praying "that the 'basis of charge' should be inquired into." Despite the presentation of this memorial, the "basis of charge" was entirely ignored by the Corporation in the case which they presented before the Committee. Mr. Richardson adverted to it on behalf of the Metropolitan Board, and that was all. The omission on the part of the Corporation affords another instance, in addition to many of a like nature, in which complaints are made but never substantiated.

Mr. Richardson, in his evidence on Tuesday last, endeavoured to show that the ultimate cost to the Water Trust, for the purchase of the undertakings according to the provisional agreements, would be nearly £40,000,000. The demonstration respecting these figures was somewhat long and complicated, as might be expected, seeing that the immediate stock bearing three and a half per cent. was to be £22,098,700, and the deferred stock £9,280,000. The present value of the deferred stock has been reckoned at something over £7,000,000, so that the total stock could only be estimated at a sum falling short of £30,000,000. No ingenuity can make the amount greater, except by extravagant assumptions. In the course of his cross-examination by Sir Edmund Beckett, Mr. Richardson acknowledged that it would be "fair" to give the Companies twenty-five years purchase of their last year's dividends, with ten per cent. added for compulsory sale. The witness was then reminded that Mr. Stoneham showed the net income of the Companies for 1879 to be £740,000. Assuming the purchase on the terms proposed by Mr. Richardson, the amount to be paid would be £20,350,000. Mr. Richardson further allowed that this should be paid "in money." He "did not think "there would be any difficulty" in making a money payment. By his own mode of calculation, Mr. Richardson brought out the value as £20,430,261. If, instead of a payment in money, as contemplated by this gentleman, we make our reckoning on the basis of three and a half per cent. water stock, it will be seen that £740,000 a year represents stock to the amount of £21,140,000. But when we come to the question of prospective profits, we find where it is that Mr. Richardson diverges so widely from the provisional agreements. He would not allow anything for future profits. Mr. Richardson was evidently surprised to find that in regard to the current income of the Companies, he was approaching so near to the figures adopted by Mr. Smith. "But," said Mr. Richardson, "we give no increment." "Then," said Sir E. Beckett, "the only difference between you and Mr. Smith "is as to the increments, and you think there ought to be no "increment?" "I think increment is a most uncertain "thing," said the witness. Yet Mr. Richardson believed that if the Metropolitan Board had the opportunity given them, they would be able to come to terms with the Water Companies, so as to purchase their undertakings. It is certain, however, that the Companies could not be expected to forego their prospective profits, and on this point we do not see how the terms could be agreed upon, unless the Metropolitan Board took a somewhat different view of the case from that expressed by Mr. Richardson.

The exaggerated and sensational comments of the public press on the terms of the provisional agreements were pungently referred to by Sir E. Beckett in his speech to the Committee. We may say that the press has not done its duty on the subject. The journalist ought not to consider himself merely as an advocate for the consumer or the ratepayer, but rather as occupying a *quasi*-judicial position between the public and the Companies. Superficial, *ad captandum* statements, on a grave public question, are beneath the dignity of true journalism. Throughout the whole discussion in the editorial columns of the press, there has been a strange disregard of the fact that the purchase of the London Water Companies works, according to the scheme of Sir R. Cross, was to be effected by "stock," and not by cash. How materially this affects the question is readily to be seen. The public are told that the Companies have only expended £12,000,000. But we see that this already gives them more than six per cent. on an average, including preference shares, loans, and debentures. If, for facility of illustration, we take the average return at seven per cent., we should like certain critics to try and estimate what difference there may be between £12,000,000 at seven per cent., and £24,000,000 at three and a half per cent. Yet when a transfer of this kind is proposed, an outcry is raised that the Companies are to receive twice what they have expended. An allowance having been made for prospective profits, thereby bringing up the proposed water stock to a present value of nearly £30,000,000, it has been alleged that the Companies were to receive nearly three times the amount of their capital. All this has answered a purpose, and a mischievous one. It has prejudiced the public against an arrangement which, if carried out, would have been beneficial to the consumers, although doubtless favourable also to the Shareholders in the Companies. Sir E. Beckett put the case fairly, when he said: "The real nature of this bargain is that "the Companies are guaranteed their present income for all "time to come, and they are guaranteed their probable "increase of income, that probable increase of income for "the future being derived from the experience of the past." Whatever may be thought of this arrangement by the outside world, the Companies are quite content to have it cancelled, providing they are let alone for the future. They are not seeking to have the agreements carried out, but are acting purely on the defensive. To them the provisional bargains present no very tempting prospect, whatever others may think of them.

The proposal to estimate the income of the Companies on an average of past years is a transparent fallacy, but is one of the methods adopted to depreciate the true value of the property. If the past income were higher than the present, we should hear a different doctrine propounded. In like manner it is unjust to exclude the fact that where the maximum dividends have not been reached, the Companies are evidently advancing towards that goal. An income that has risen and is continuing to rise must represent something more than the value which corresponds to a falling or stationary income. Sir W. Harcourt's favourite mode of examination, by which he elicited answers showing how many years purchase was to be obtained by the Water Companies under Mr. Smith's agreements, was effectually dealt with in the speech of Sir E. Beckett. The amount of stock to be given in purchase of the undertakings depended on the rate per cent. It was, therefore, absurd to take the amount of stock as showing the number of years purchase. The actual cost to the purchaser would remain the same whether £11,000,000 were paid in 7 per cent. stock, or £22,000,000 in 3½ per cent. stock. Yet in the latter case the number of years purchase, according to the popular reckoning, would be double the number in the former case. Using this argument, Sir E. Beckett went on to say: "Therefore I wish the public to "understand that all the talk there has been, all the "speeches that have been made, all the articles in news-"papers that have been written, about giving some enormous "number of years purchase, are entirely nonsense; they mean "nothing; they are merely talk about arbitrary figures." "In fact," said Sir Edmund, "every word that has been said "in this room, and out of this room, about the number of "years purchase to be given for the present value, has "nothing upon earth to do with the subject."

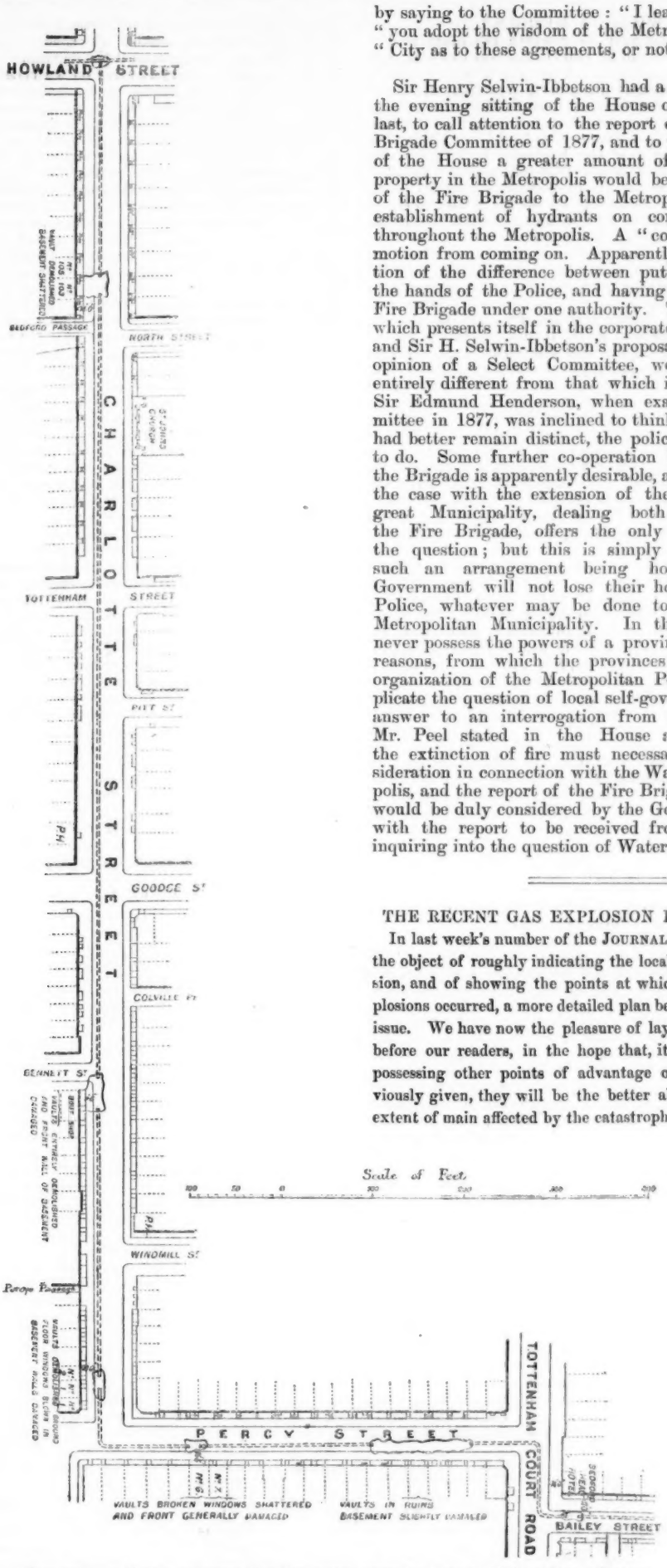
If an able address from a learned Counsel could have weight with a Select Committee, so as to overcome a strong adverse impression, we might surely hope that the speech of Sir E. Beckett would avail to produce a report more or less favourable to the terms agreed upon by Sir R. Cross. The speech can hardly fail to produce some effect; but while we give the Committee full credit for seeking to get at the truth, it is to be feared that the popular view, so assiduously and vigorously promulgated prior to the opening of this inquiry, will prevail in the preparation of the report. The opposition of the Metropolitan Board and the City authorities to the terms negotiated by Mr. Smith will necessarily influence the decision, and the result is too likely to be of the nature we have already intimated. As to the next step, Sir E. Beckett signified that the evidence given on this inquiry had shown the Companies more clearly than ever what "an extremely "good bargain" they had offered to the Government. In the future, said Sir E. Beckett, the Companies would be careful not to bind themselves and leave their opponents free. Supposing an arbitration to be enforced, "we may do as they did at "Birmingham," said Sir Edmund; "we may compromise the "arbitration rather than try it out." But all was uncertain, and the learned Counsel for the Water Companies concluded

by saying to the Committee: "I leave you to judge whether "you adopt the wisdom of the Metropolitan Board and the "City as to these agreements, or not."

Sir Henry Selwin-Ibbetson had a notice on the paper for the evening sitting of the House of Commons on Tuesday last, to call attention to the report of the Metropolitan Fire Brigade Committee of 1877, and to move that in the opinion of the House a greater amount of protection to life and property in the Metropolis would be attained by the transfer of the Fire Brigade to the Metropolitan Police, and by the establishment of hydrants on constantly charged mains throughout the Metropolis. A "count out" prevented the motion from coming on. Apparently there is little appreciation of the difference between putting the Fire Brigade in the hands of the Police, and having both the Police and the Fire Brigade under one authority. The latter is the example which presents itself in the corporate towns of the provinces, and Sir H. Selwin-Ibbetson's proposal, though backed by the opinion of a Select Committee, would produce something entirely different from that which it is supposed to imitate. Sir Edmund Henderson, when examined before the Committee in 1877, was inclined to think that the Fire Brigade had better remain distinct, the police already having enough to do. Some further co-operation between the Police and the Brigade is apparently desirable, and this will be especially the case with the extension of the hydrant system. One great Municipality, dealing both with the Police and the Fire Brigade, offers the only effectual settlement of the question; but this is simply theory, the prospect of such an arrangement being hopelessly remote. The Government will not lose their hold on the Metropolitan Police, whatever may be done towards creating a great Metropolitan Municipality. In this respect London will never possess the powers of a provincial borough. Political reasons, from which the provinces are exempt, affect the organization of the Metropolitan Police, and serve to complicate the question of local self-government in London. In answer to an interrogation from Sir H. Selwin-Ibbetson, Mr. Peel stated in the House a few nights ago, that the extinction of fire must necessarily be a primary consideration in connection with the Water Supply of the Metropolis, and the report of the Fire Brigade Committee of 1877 would be duly considered by the Government in connection with the report to be received from the Committee now inquiring into the question of Water Supply.

THE RECENT GAS EXPLOSION IN THE METROPOLIS.

In last week's number of the JOURNAL we gave a small map with the object of roughly indicating the locality of the recent gas explosion, and of showing the points at which the several successive explosions occurred, a more detailed plan being promised in the present issue. We have now the pleasure of laying the accompanying plan before our readers, in the hope that, it being drawn to scale, and possessing other points of advantage over the rough sketch previously given, they will be the better able to form an idea of the extent of main affected by the catastrophe.



PLAN SHOWING POINTS AT WHICH GAS EXPLOSION OCCURRED, JULY 5, 1880, IN PERCY STREET AND CHARLOTTE STREET.

THOMAS WILLS: A MEMOIR.*

In the month of May last year we recorded the death of Mr. Thomas Wills, who, although not 29 years of age when he died, was already widely known as a chemist and lecturer of great promise. In connection with the science of gas-making especially, much was expected from his future; for to it, as to each of the pursuits in which he was interested, he devoted himself with rare intelligence and unflagging energy. The lectures which he delivered before the Manchester District Institution of Gas Engineers in 1872 and the British Association of Gas Managers in 1878—the one on "Residual Sulphur in Gas," and the other on "The Products of Combustion"—displayed not only a complete acquaintance with his themes so far as they had been then investigated, but they also contained largely the thoughtful suggestions of an original observer.

As Secretary to the Chemical Section of the Society of Arts, a position which he held from the formation of that section until his death, he succeeded in obtaining from year to year a succession of admirable papers, and in maintaining its usefulness and interest to the full satisfaction of the Council and members. He was also one of a Committee of three appointed by the British Association for the Advancement of Science to inquire into and report upon the best means of developing the illuminating power of coal gas; and would, had he lived, have prepared the second part of the report, which should have been presented at last autumn's meeting of the Association. Immediately before his death Mr. Wills was conducting experiments upon the relative values of gas and electricity for purposes of illumination, and in the course of these experiments he observed that nitric acid was formed by the burning of the electric light, and communicated the fact to the Chemical Society. Professor Tyndall referred to this discovery in his evidence before the House of Commons Committee last session on Electric Lighting, and Mr. Wills was gratified upon his death-bed by hearing that the Professor had named him in connection with it.

Ambitious without apparently a trace of vanity or self-seeking—ambitious rather to do useful work for the sake of the truth it might teach, or the good it might do, than for any praise or advantage it might bring to him—Mr. Wills never spared himself. The writer and others warned him in the winter of 1878 that he should limit his labours, and he promised to do so when he had fulfilled the engagements he had made. Before, however, this was done he was prostrated by fever, from which he had not strength to rally.

The little book which loving hands have compiled will be read with interest by all those who knew the late Mr. Wills, and it will be welcome also to those who value the history of a good life, told, as in this case, with a touching enthusiasm. The volume contains abstracts of several of the papers written, and lectures delivered by Mr. Wills, and, in an appendix, a very full report of his three lectures on "Explosions in Coal Mines," delivered before the Society of Arts, and for which he received the Society's medal. It is also embellished with an admirable portrait.

Communicated Article.

EXPLOSIVE MIXTURES OF COAL GAS AND AIR.

By Mr. W. Foster, M.A., &c.,
Professor of Chemistry at the Middlesex Hospital.

The disastrous events which have recently occurred through the ignition of explosive mixtures of coal gas and air have excited a considerable amount of attention, and have given rise to much unnecessary anxiety. As an abstract proposition, the dangerous nature of a mixture of coal gas and air is generally understood not only by those engaged in the manufacture and distribution of gas, but also by a large section of the educated public. The best practical method of dealing with such mixtures and of preventing their formation is, however, a matter on which much misconception exists; and this chiefly arises from an insufficient appreciation of the general properties of gaseous bodies. A knowledge of the practical bearing of the laws of the diffusion of gases is not by any means so general as one could wish. The present, therefore, appears a fitting occasion for a few observations on a subject of the greatest importance to all concerned in the manufacture and use of coal gas. It may appear an idle statement to say that coal gas, in a confined vessel, is perfectly harmless; but unfortunately one is continually meeting with persons in all grades of society who do not share such a simple opinion. It therefore often becomes a part of the gas manager's duty to instruct his customers with reference to the properties of the article he manufactures.

Coal gas, whether cannel or common, is a mixture of several gases with the vapours of hydrocarbons of low boiling point. By far the greater portion of any given volume of common gas consists of hydrogen and marsh gas (CH_4), the sum total of these two components varying from 80 to 90 per cent. of the whole. In 1851, Dr. Frankland made an analysis of the common gas supplied by the Chartered Gas Company in London, and in 1876 the same Company's common gas was analyzed by Mr. Humpidge. The results of these two analyses, so far as the chief components are concerned, are given in the following table:—

	1851.	1876.
Hydrogen	51·8	50·5
Marsh gas (CH_4)	35·2	38·3
Carbonic oxide (CO)	8·9	3·1
Heavy hydrocarbons expressed in their equivalents of olefiant gas (C_2H_4)	7·7	7 8

* "The Life of Thomas Wills, F.C.S., Demonstrator of Chemistry, Royal Naval College, Greenwich." By his Mother, Mary Wills Phillips, and her Friend, J. Luke. London: J. Nisbet and Co. 1880.

Now each of these components when allowed to escape from a containing vessel into the external atmosphere can be ignited and consumed like any other combustible material. The oxygen of the external air is necessary to carry on the chemical action which is commenced by the application of the ignited substance; and, in the case of the gases containing carbon, further provision is necessary for the removal of the carbonic acid gas produced. The high temperature required to start the combustion of the gas is maintained by the chemical combination of the latter with oxygen. Coal gas does not differ in these points from its individual components. For its ignition the heated body must have a temperature of a certain quality—a circumstance quite apart from the total amount of heat which it may possess. The smallest spark of brightly incandescent matter, whether solid or gaseous, is sufficient to inflame a jet of coal gas escaping in atmospheric air. An excellent illustration of this phenomenon is afforded by the use of the electric spark. If a person insulate himself from the earth by standing on a stool having glass legs, or on a couple of glazed earthenware jars, and whilst in this condition place his hand on the conductor of an electrical machine, sparks may be taken from his body during the time the machine is put in motion by a second individual. If a jet of coal gas be allowed to escape from a metallic burner within his reach, on his extending his other hand, and causing one of his fingers to approach the burner from above, a spark will at length pass to the burner, producing ignition of the gas. [It will be remembered that this principle was advocated on a limited scale a few years ago when there was a prospect of a tax being imposed on lucifer matches. The apparatus was ingenious but cumbrous.] In this experiment the particles of gas in the track of the spark are rendered brightly incandescent; and although their mass must be extremely small, yet they are capable of setting up a similar condition throughout the whole gas-jet. On the other hand, comparatively large masses of solids at lower temperatures are incapable of setting up a similar condition of things. For instance, a coal cinder at a dull red heat, and devoid of flame, will not cause ignition of a jet of coal gas, neither will the dull red embers of a recently extinguished deal wood match. It is clearly obvious, therefore, that heat as a quantity is not essential to the commencement of the phenomenon of ignition. The substance, whether solid or gaseous, must possess those qualities which enable it to emit light radiations of a certain order—those which are particularly abundant at the more refrangible end of the spectrum produced by a source of white light.

If the composition of a sample of coal gas be given, the amount of oxygen (and therefore of atmospheric air) required to effect its perfect combustion is a matter of simple calculation. Let us consider the case afforded us by Dr. Frankland's analysis. As every two volumes of hydrogen require one volume of oxygen, the 51·8 volumes of hydrogen given in the analysis require 25·9 of oxygen. Every two volumes of marsh gas require four volumes of oxygen, and therefore 31·5 would require 63·0. Every two volumes of carbonic oxide require one of oxygen, and therefore 8·9 require 4·4. Every two volumes of olefiant gas require six of oxygen, and therefore 7·7 require 23·1. The results of these four independent oxidations are expressed in chemical symbols, as follows:—

$$\begin{aligned} H_2 &+ O &&= H_2O \\ CH_4 &+ 2O_2 &&= 2H_2O + CO_2 \\ CO &+ O &&= CO_2 \\ C_2H_4 &+ 3O_2 &&= 2H_2O + 2CO_2 \end{aligned}$$

On adding together these several quantities of oxygen, we find that 100 volumes of such common gas require 116·4 volumes of oxygen for their complete combustion. As every five volumes of air contain one of oxygen, it follows that the quantity of atmospheric air necessary to completely effect a like result is 582 volumes. In other words, one volume of gas of the quality under consideration requires nearly 6 volumes of air (5·8). I need hardly say that, in practice, larger volumes of air are necessary to carry on the ordinary process of combustion in an efficient manner, the surplus air assisting very materially in removing the products of oxidation from the points where they are produced. When atmospheric air is mixed with coal gas in the proportion of about 2½ volumes of the former to 1 of the latter, the mixture can be ignited when issuing from an ordinary burner, and consumed in the same way as the undiluted coal gas. The character of the flame, however, differs from that produced by the pure coal gas in that it loses, in a very marked degree, its light-giving properties. This phenomenon has given rise to much experiment, and is the result of several influences operating somewhat differently. Their consideration is outside our present question. In the case of a mixture having the proportions I have just named, it is obvious that a considerable proportion of oxygen is required for the complete combustion of the gas. This additional quantity is derived from the external air, as in ordinary cases. If we take a mixture of gas and air in the proportions needed for the complete combustion of the gas (and, in the case of the particular quality we have already considered, we shall require 6 of air to 1 of gas), such a mixture can be burnt under special circumstances, and is, *theoretically*, quite independent of any supply of oxygen from external sources. Such a mixture is explosive. Suppose, for instance, that a cubic foot of it be confined in a spherical vessel, and that a flame be applied to a portion of the gaseous mass; rapid combustion of the mixture would immediately follow with explosive violence. As it contains in its own substance the oxygen required to form the ultimate oxidation products, and as these are gaseous, and produced at an excessively high temperature in a very short interval of time, the pressure which they exert on the sides of the containing vessel is very great. One speaks in general terms of such an explosion as being instantaneous. Such, however, is

not absolutely the case. A certain definite interval is needed for the completion of the action which has been commenced by the application of the lighted substance. In other words, the flame applied to the explosive mixture traverses its substance with a certain velocity. The proportion of gas and air now considered are those which we have deduced from the analysis. In practice, however, where explosive mixtures are needed, as in the modern gas-engines, a larger proportion of air is required to yield the maximum explosive force, and in the case of ordinary common gas about 1 volume to 8 volumes of air furnishes the best results. We will consider the behaviour of mixtures of gas and air in varying proportions subsequently. Let us for the present confine our attention to the behaviour of a cubic foot of an explosive mixture when ignited in vessels of the same capacity but of different shapes. I have selected a spherical vessel as the starting point in our discussion, because it is symmetrical. When filled with an explosive mixture and fired, there is a greater pressure on each unit of area of surface than in any other vessel of the same capacity, because a less interval of time is necessary for the passage of the flame to every portion of the explosive mass. In order to realize the velocity of the passage of the flame through the explosive mixture, we must alter the shape of the containing vessel. A cylinder is the best adapted for our purpose. A cylinder a yard long and about 8 inches in diameter would have a cubical capacity of one foot, and when filled with the explosive mixture and fired at one end would not produce such a very marked effect as in the former case. A tube 2 inches in diameter would require to be about 16 yards long, and if filled with the explosive mixture and fired at one end as before, we should be able to distinctly realize the interval required for the passage of the flame from one end of the tube to the other. The explosive action would also be very considerably diminished. If we now take a tube having a diameter of half an inch, it would require to be 256 yards in length in order to have a capacity of one cubic foot, and if we were to take any convenient length of such a tube made of glass, and fill it with the explosive mixture, on igniting it at one end we should observe that the flame would pass down the tube without giving rise to any explosive action, and at such a rate as to admit of its velocity being measured. There are two important influences tending to bring about this modification of the result. Firstly, but a small quantity of the explosive mixture is consumed in a short interval of time; and, secondly, there is the cooling effect of the sides of the tube on the gaseous products of combustion. Their temperature is never so high as when produced in larger masses, because the cooling action of the sides of a cylinder is greater in proportion to its diminished diameter. This is easily shown by the following considerations. Taking the ratio of the circumference of a circle to its diameter as 3 (this has been done in former calculations), our first cylinder—namely, that having a length of 36 inches and a diameter of 8 inches—gives 24 × 36 or 864 square inches as the area of its containing sides. In the last case where the ½-inch pipe must have a length of 256 yards in order to furnish the same cubical capacity, we find that the area of its containing sides is

$$3 \times \cdot 5 \times 256 \times 36, \text{ or } 13{,}824 \text{ square inches.}$$

The area of the sides of this ½-inch pipe is therefore 16 times greater than that of the shorter cylinder, and consequently every cubic inch of the explosive mixture consumed in the ½-inch pipe is exposed to an area of cooling surface 16 times greater than that which obtains in the other. By diminishing the diameter of the pipe still further, we should at length arrive at such a condition of things that the cooling influence of the sides would prevent the transmission of flame by the explosive mixture. The circumstances would then be such that the temperature of ignition of the explosive mixture could not be maintained by its own combustion.

We have assumed in these imaginary experiments with cylindrical vessels that the pressure of the explosive mixture in their interior is equal to that of the atmosphere, and in so doing have only partially considered the case. When the pressure is greater than that of the atmosphere, we bring a new feature into the discussion. Its bearing on recent events is most important.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

MR. METHVEN'S TEST FOR ILLUMINATING POWER.

Sir,—I have read and re-read several times the letter of Mr. W. Lyon, which appeared in your issue of this day (July 13), and have only succeeded in realizing that he has an eccentric notion as to what a "Methven's test" is, and an equally eccentric notion as to the manner in which the illuminating power of gas may be determined.

Taking the left-hand column of his table as indicative of the rate of consumption with the screened burner (representative of Methven's), I find such rates to vary from 2·742 to 4·554 cubic feet per hour. What does this mean? Does Mr. Lyon mean that a 3-inch flame was in each experiment obtained, with such extreme differences in the rates of consumption? If not, what then? Did he work with various lengths of flame? for if he did the latter thing, I say, for the first time, that his results are worthless.

Again, I find that with the opposed Argand the rates of consumption varied from 4·044 to 6·074 cubic feet per hour, and that in the last column the illuminating power for 5 cubic feet has been calculated up and down from such extremely divergent rates. For the second time I say his results are worthless, inasmuch as the light given by a flame produced by the combustion of gas at the 5-cubic feet rate, cannot be deduced, with any near approach to accuracy, from results obtained with consumptions varying more than 2 or 3 per cent. from the standard rate.

So much for the "table." Next as to the "test" light which Mr. Lyon has so carefully described in the following words, and thereby made manifest that he did not operate with Methven's test at all, but with some crude conception of his own. These are his words: "On each end of the rail is fixed one of Sugg's 15-hole 16-candle Argand burners, with a 7-inch by 2-inch chimney. The centre of the slice [or slit, the size of which Mr. Lyon does not state] fixed on my left hand is 2 inches above the perforated face of the Argand, and 1¼ inches from the side of the chimney." These few words show that Mr. Lyon is wrong as to the burner, wrong as to the position of the slit, wrong in the length of chimney, wrong in the distance between the burner and the slit, besides being (as already shown) wrong in his method of estimating illuminating power. His letter is unique, for surely never before were so many errors included in one brief epistle.

Mr. Lyon has made a screen and applied a burner in ignorance the while of what constitutes a true "Methven's test." Verily the said "test" is not at all likely to be condemned any more than candles are likely to be upheld by such testimony as Mr. Lyon has given. In due time he perhaps may become converted, like myself, and then be an advocate for "Methven's test." I now advise him to re-study the subject, and make new experiments in a manner more consistent with the requirements of accuracy than marks those which he has made.

I have kept this letter as brief as I could, and so I deem it needful to say that if any expression herein seems contradictory to the statements which I made in my paper read before, and in my reply to speakers at the recent meeting of the British Association of Gas Managers, I am prepared to prove my consistency.

55, *Millbank Street, S.W., July* 13, 1880. F. W. Hartley.

MR. HARTLEY'S CRITIQUE OF MR. NIVEN'S PAPER ON CORRECTIONS FOR TEMPERATURE AND PRESSURE.

Sir,—I observe in your last number the final letter of Mr. Hartley regarding my paper. We are under a debt of gratitude to him, for his letters are not only most courteous, but replete with information. I find he has a keen blade in the fight. I frankly and freely admit that he has caught me napping when I (*lapsus pennæ*) wrote t^{60}, which, as he says, "means t raised to its 60th power; and, if t be taken as 2 only, its 60th power would come to more figures than the printer of the Journal would care to find." This is, indeed, true. But how few would notice the difference between $60t$ and t^{60}, that is, between a coefficient and an exponent. Of course $t = 60$ is obvious. By the *argumentum ad absurdum* Mr. Hartley says let $t = 2$, and the 60th power is absurd. For the curious, I may state that the number of figures in a row or by notation of the 60th power of 2 would be trillions. Thus, log. $2^{60} = 18{\cdot}0618000$; that is to say, there would be a row of 19 figures. Now, as a row of 7 figures makes a million, the enormous sum may be understood. But suppose $t = 1$, what would t^{60} be? Why only 1, and the printer of the Journal would have no difficulty in printing the figure 1. Mr. Hartley has corrected my mistake.

Now, in closing, I would like to give Mr. Hartley the following complex *argumentum ad hominem*. If, as he says, Mr. Vernon Harcourt, two years ago calculated the new table in accordance with Regnault's coefficient, and took aqueous tension also into account, and that the propriety of the Metropolitan Gas Referees in issuing the new table is beyond question, and that the old table must now be regarded as "obsolete," why will Mr. Hartley not publish his appendix to his "Manual" in a pamphlet form *separately*, not only for ready use, but also as being a common authority to which all can appeal, and by which uniform results can be attained?

I also notice a very long letter from Mr. Lewis T. Wright. As I think that he has either had a month's special preparation to write it, or that, like Rip Van Winkle, he has been napping, I wish you to give me space in your next issue to consider his prelections. I am sure, and brother managers will concur, that in the masterly hands of Mr. Hartley his father's name will never suffer, and, in fact, there is not the least shade for such an implication.

Dunoon Gas-Works, July 16, 1880. D. Coats Niven.

[We may state, in reference to our correspondent's remarks, that the appendix to the "Gas Analyst's Manual" was published apart from the book itself, in accordance with the announcements made at the time of its issue in the early part of last year.—Ed. J. G. L.]

THE SANITARY INSTITUTE OF GREAT BRITAIN.

Sir,—*Re* the Sanitary Institute of Great Britain. As a member of the Council I was present at the recent annual meeting, which you refer to in this week's "Water and Sanitary Notes." The reporter was quite right; Mr. Chadwick said: "The principle laid down, if it had been neglected at home, had been thoroughly dealt with abroad—in Germany and France, for instance, and therefore their labour had not been thrown away; it had been carried out *somewhere*."

Lower Sydenham, S.E., July 14, 1880. Magnus Oheen.

LIEGEL'S REGENERATOR FURNACES.

Sir,—Referring to the letter of Herr Kloenne in your issue of yesterday, it will, of course, be necessary to wait for the drawings he has promised before determining what resemblance the Liegel furnace bears to that designed by him.

In the meantime, as the drawing No. 2, to which he refers, represents my own variation of the Liegel furnace, allow me to state that, however it may resemble Herr Kloenne's furnace, it is *not* a "copy." I have never heard Herr Kloenne's name before, nor seen any furnace designed by him, and the drawing which I exhibited at the recent meeting of the British Association of Gas Managers, as illustrating the furnace erected at these works, was adapted from the full-sized furnace of which I received drawings from Herr Liegel, and which is represented by drawing No. 1. Examples of both these furnaces are now at work at Maidstone and at Peterborough, with very successful results.

It is strange that furnace No. 1 should, according to Herr Kloenne be a copy of one of his furnaces of the "earliest construction," and abandoned by him long ago; while No. 2, which is really a less perfect

furnace, is a copy of his "latest improvement in gas furnaces," although both "do not," so he says, "properly belong to the class of gas generators, but are simply what may be called 'open fires.'" The inconsistency in this statement is very apparent.

G. E. Stevenson.

Gas-Works, Peterborough, July 14, 1880.

Parliamentary Intelligence.

HOUSE OF LORDS.

Monday, July 12.

Gas and Water Orders Confirmation Bill.—This Bill was read the third time, and passed.

Petitions were presented against the Oldham Improvement Bill, from (1) Inhabitants and ratepayers of Ashton-under Lyne (Henry Brockley and others), and (2) Churchwardens and Overseers of the Poor for the parish of Ashton-under-Lyne.

Tuesday, July 13.

Petitions were presented against the King's Lynn Corporation Bill, from (1) Richard Bagge and another, (2) Norfolk Estuary Company, (3) Fishermen of King's Lynn, (4) Ratepayers of King's Lynn; and against the Oldham Improvement Bill, from the Earl of Stamford and Warrington, and Owners, &c., of property in the parish of Ashton-under-Lyne (Samuel Lees and others).

Thursday, July 15.

The Chairman of the Select Committee on the Wigan Improvement Bill reported that the Committee had not proceeded with the consideration of the Bill, the opposition thereto having been withdrawn.

Petitions were presented against the Liverpool Corporation Water Bill, from (1) Edward Grindley and others, (2) Runcorn Improvement Commissioners; and against alterations in the Bill, from Great Western Railway Company.

Friday, July 16.

The Hull Lighting Bill, the King's Lynn Corporation Bill, and the Oldham Improvement Bill were referred to a Select Committee, consisting of Earl Dartrey (Chairman), Lord Braye, Lord Saye and Sele, Lord Oranmore and Browne, and Lord Rowton; to meet on Monday, July 19.

A petition was presented against the Dagenham and District Farmers (Optional) Sewage Utilization Bill, from Commissioners of Sewers for the Levels of Havering, Dagenham, &c.

HOUSE OF COMMONS.

Tuesday, July 13.

The Rathmines and Rathgar Township Water Bill (Lords) was referred to a Select Committee, consisting of Sir Wilfred Lawson (Chairman), Mr. Gore-Langton, Mr. Grenfell, Mr. Coddington, and Sir John Duckworth (Referee); to meet on Tuesday, July 20. [The British Gaslight Company, Limited (Staffordshire Potteries) Bill (Lords) was referred to the same Committee, but was afterwards withdrawn, owing to the *locus standi* of the Corporation of Hanley and consumers of gas in the district, petitioners against the Bill, having been disallowed.]

HOUSE OF COMMONS COMMITTEE.

Thursday, June 17.

(*Before Mr.* Dodds, *Chairman; Mr.* Schreiber, *Mr.* J. M'Carthy, *and Mr.* Northcote; *Sir* John Duckworth, *Referee.*)

MAIDSTONE GAS BILL.

(*Continued from page* 60.)

Mr. *George Wilson Stevenson*, examined by Mr. Pope.

I have visited Maidstone for the purpose of examining the Gas Company's works, and consider they ought to have additional land and storeage. At the present time they only require a new gasholder, but in the immediate future they must expend money upon increased plant on a new site. I adopt the figures of Mr. West, who is intimately acquainted with the place and the wants of the Company, and I say that the standard price works out to 47·11d. I consider 3d. would suffice to raise the illuminating power from 14 to 16 candles. Within the last 10 years 315 Acts and Provisional Orders have been passed by Parliament, and of these 251 have a prescribed standard of 14 candles, 5 have less than, and 59 more than 14; but about a dozen of the latter class are in Scotland, where ordinary coal is not used. The amount of capital asked for appears to be reasonable, but there is no inducement to a company to expend capital, when they are obliged to offer it to the highest bidder at a public auction. The only limit should be that they should not be able to go on too long without again coming under the revision of Parliament. I think there should be a differential rate between the borough and the outlying districts, because of the extra cost of distribution. In no single instance has a Provisional Order contained any other stipulation as to purity than freedom from sulphuretted hydrogen. Last year there were only two Acts passed in which a limitation was placed upon the sulphur compounds—viz., the Newcastle and Gateshead and the South Shields—20 grains being inserted as the maximum. In the previous year there was only one instance—Shrewsbury—where 20 grains was inserted; and in 1876, again, only one instance—Norwich—where the limit was 30 grains.

By the Committee: There are no instances in 1877. In the cases of Cheltenham in 1872 and Bath in 1875, the amount of sulphur other than sulphuretted hydrogen is limited to 30 grains, and there is also a limitation as to 5 grains of ammonia in each case.

Cross-examined by Mr. Kingsford: The Maidstone Company require an addition of four or five acres to their land. In making this statement I have not regarded the limits particularly, but refer to the increased demand upon the Company, irrespective of the extension of districts. I agree with the last witness that the necessary gasholder capacity should be equal to about a million cubic feet, and considering the size of this undertaking I should put down the next gasholder for half a million feet capacity, which I think would be a wise, prudent, and economical expenditure. Several of the 59 Provisional Orders prescribing more than 14 candles illuminating power have reference to towns in Lancashire—Ashton-under-Lyne, and places of that kind—which are close to the cannel coal-fields. The majority have been granted in the last six years.

A Member of the Committee: Therefore there is a growing tendency to insist upon a higher limit?

Witness: There is.

Cross-examination resumed: The burners in use at present certainly do not diminish the illuminating power of gas, as the old burners used to do. An old brass burner was formerly employed for testing, which required to be supplied with gas under very considerable pressure, in order to obtain 5 feet per hour from it. The gas had not time to meet the oxygen in the atmosphere, and a very large portion of the flame was blue, and therefore gave no light. Subsequently an improved burner, called the Letheby burner, was invented, which improved the illuminating power about two candles. By section 53 of the Act of 1868, the burner prescribed was an Argand burner with 15 holes and a 7-inch chimney, but at present the Company are using Sugg's No. 1 "London" Argand, with 30 holes.

Mr. Kingsford: What difference in candles would this show?

Witness: The burner prescribed by the Company's Act can be made to give an illuminating power nearly, if not quite equal to the No. 1 "London," burner, which is used by the Gas Referees in London, and is included in the present Bill.

Cross-examination continued: With regard to the place and time of testing, I do not think it is of any consequence that notice should be given; indeed, I think the Act of 1871, which it is proposed should be incorporated, provides for testing without notice. There is a provision in the Bill for two hours notice, but in the interest of the Company I say that might be struck out. The illuminating power could be changed very quickly at a testing-station, providing all arrangements were made to do it, and there was an intention to deceive.

A Member of the Committee: Supposing the intention, what time would be required to give effect to it?

Witness: Not more than an hour. Suppose a special main were laid on from the works to the testing-place, and a special small gasholder employed for receiving the improved quality of gas, that improved quality could be made and sent to the testing-place within an hour.

Cross-examination resumed: The quality of the gas flowing through the ordinary mains could not be changed in a place like Maidstone, which is too big for the operation. I knew it to be done at Uxbridge a good many years ago, when the consumption was not more than half what it is now.

By the Committee: At the close of the present year the Company ought to begin making extensions for the future. They would have to erect a new purifier immediately if the proposed sulphur clause is forced upon them.

Mr. *Alfred Penny*, examined by Mr. Pope.

I have visited Maidstone, examined the gas-works, and gone over the district to be supplied. An additional gasholder is required, but there is no space for it on the land now occupied. The owner of the 7½ acres which have been provisionally bought will not part with a portion of it; the whole must be taken, or none. The Company have therefore acquired the whole, simply because they cannot obtain what might have been sufficient. I think, however, that the acquisition of this land is what they may be fairly permitted to make; otherwise in the future, when they require more land they will have to pay an enormous price for it, and the greater the price the worse for the consumers. Taking all the figures which the Committee have had before them, I think 4s. per 1000 feet would be a proper standard. With regard to purity, I am aware that if a company are compelled to reduce their sulphur compounds to anything like 20 grains per 100 feet of gas, it entails a very large cost, although I do not say it is impossible to be done. The real principle appears to be that the gas must be passed through the purifiers at a very slow sluggish rate before those compounds can be eliminated, and this compels gas companies to double or treble the size of the purifiers which in the olden time were considered sufficient.

By the Committee: If I were the Engineer of the Maidstone Gas Company, I should consider it necessary to provide nearly the same amount of apparatus for 25 grains that I should for 20 grains. I consider the offer of 25 grains with an average of three days to be very reasonable.

Cross-examined by Mr. Kingsford: I have inspected the purifying apparatus of the Maidstone Gas Company, and consider it to be of no use in the winter, because it is not sufficiently large. If the Company were placed under a restriction of 20 grains per 100 feet, I should say they would require four more purifiers. The sulphur may have been as low as 12 grains, but it has been up to 34 grains. What we have to provide for is, not taking out the sulphur in summer, but doing so in the depth of winter. The variation in the quantity of sulphur is the most aggravating thing a gas manager has to contend with. He may leave the testing-place thinking that all is right, and then may be summoned by some one and told the sulphur is up to 30 grains. Those fluctuations do not occur in London in the testing-rooms of the Metropolitan Board of Works or the Corporation, but they do occur in the works themselves, and cause annoyance and misery to the managers. The Maidstone Gas Company up to the present time have not been under any penal obligation to reduce the sulphur in their gas, and have not the apparatus to do it. If they are placed under bonds by this Committee, they will have immediately to provide extra purifying machinery.

Mr. *George Livesey*, examined by Mr. Pope.

I am Engineer and Secretary to the South Metropolitan Gas Company, and have given attention to gas manufacture all my life. I was one of the first who acted in concert with the public authorities in relation to the appointment of Gas Referees in the Metropolis, but my Company was against me. I am familiar with the question of sulphur purification, and consider the Maidstone Company's offer of a restriction of 20 grains and an average of three days to be very liberal. It is better than exists in London, where there is an average of three days and 20 grains in summer, and a similar average and 25 grains in winter. The average of three days was accepted because there are very great difficulties in ensuring the purification of gas from sulphur compounds. In the first place, the excess is not discovered until the day after it has happened; and when once the purifiers have got into an improper state it is impossible to restore them immediately—or, in fact, even in three days, which is the shortest average which could be accepted as reasonable in any way.

The Referee: Do I understand you to say that two days on which there is an excess must be corrected by a diminution on the third day?

Witness: That is so. The Acts of The Gaslight and Coke Company and the South Metropolitan Gas Company, passed in 1876, prescribe this. If there is an excess one day, the amount the day following and the day preceding should be taken with it, and the average of the three days assumed to be the average of that one day.

By the Committee: The same provisions are contained in the Commercial Gas Company's Act of 1875. A maximum of 20 grains with a three days average means a good deal less than 20 grains on an average.

Cross-examined by Mr. Kingsford: In order to keep within the limit of 20 grains, the removal of the sulphur compounds is so uncertain a process that the Company must work to about 10 or 12 grains.

Mr. Kingsford: When you say you consider this offer of 20 grains and the three days average an exceedingly liberal one, with what standard of price do you assume that would be taken?

Witness: My instructions were simply to give evidence in relation to the sulphur impurity. All I can say is that if the town wishes to have gas at a maximum sulphur impurity of 20 grains, they must pay for it. It involves double the extent of purifiers which would otherwise be required if there were no such restriction, and about double the quantity of materials and labour for purifying. With those restrictions the Company would require 2d. more per 1000 feet.

You differ from some of the witnesses, who say that 1d. per 1000 feet would be enough?—I take it that 1d. per 1000 feet is interest on capital

expended on the additional plant, and another 1d. for extra labour; and there is the nuisance besides, which the public would have to submit to.

I take it that the nuisance the public would have to submit to, if the polluted gas were driven into their houses, would also be considerable?—I have studied that question, and have never found a tittle of evidence to show that there is an atom of truth in it.

You think that pollution of gas with sulphur is more beneficial than otherwise?—It is certainly totally inappreciable, and not a single public authority which I am aware of trouble themselves about the sulphur when once the gas supply gets into their hands. No one has ever asserted that it has the slightest effect upon health, nor have I ever yet met with proof that it affects brass.

By the REFEREE: The Metropolitan Gas Referees issue their Instructions every March and September, but for the last seven or eight years they have not varied from 25 grains for the winter six months, and 20 grains for the summer six months.

A MEMBER of the COMMITTEE: Imagine three classes of cases—one where the requirement is that there shall not be more than 20 grains of sulphur at any time; a second where there shall not be more than 20 grains in summer, and 25 in winter; and a third where there shall not be more than 20 grains on an average of three days; would there be any considerable difference in the cost of purification under any of those three conditions?

Witness: Not considerable; I should not put the extreme difference at more than 2d.

The CHAIRMAN: That is what we are arguing about, is it not?

Mr. POPE: The Corporation having refused our overtures, what passed yesterday must be considered to be without prejudice.

The CHAIRMAN said he quite understood this. The Committee, however, wanted to ascertain the actual facts for their guidance hereafter, although at present they had not arrived at any conclusion.

Mr. *Thomas William Keates*, examined by Mr. POPE.

I am Superintending Gas Examiner to the Metropolitan Board of Works, and have directed my attention to the question of sulphur purification. I think the offer which has been made by the Maidstone Gas Company to the Corporation with regard to sulphur is an extremely liberal one—viz., 20 grains with three days average. It places the Company in a considerably worse position than the London Companies are in, not only on account of the average, but the London Companies have another element of relief. There is a Chief Gas Examiner appointed by the Board of Trade, who is an officer of appeal. In case of defective lighting power or want of purity in the gas, the Companies have the power of appealing to this officer, and if he should decide that the defect arises from circumstances beyond the control of the Company, his decision is final, and the Company are exonerated. The quantity of sulphur in London is regulated according to the position of the works, those which are called urban works being allowed a larger amount than those which are extra-urban; the reason being that the material which is used is extraordinarily noxious, and a most stinking and foul thing. It has been found extremely difficult to deal with this material in gas-works which are situated in town—for example, at Fulham, or at the South Metropolitan Company's works.

Mr. POPE: We have had certain alternative processes, so to speak, before us; in your judgment, would that which you think a liberal one of 20 grains on an average, and a three days test, involve any serious expense in addition to the one where you have 25 grains allowed you in the six months of winter?

Witness: I am not prepared to speak as to the cost—that is a question for an engineer; but I am sure that, in proportion as you lower the standard, so you cast upon the Gas Company a very greatly increased onus, because the difficulty of reducing the sulphur from 25 to 20 grains is vastly greater than to reduce it from 30 to 25, and so the difficulty goes on increasing. The fact is that neither engineers nor chemists have really been able to deal with the question; and although in London the average quantity of sulphur is low, it is kept down solely through the great experience of the Engineers allowing them to work in a sort of empirical way, which enables them to show, but in a way no one can understand, that it can be done.

It is, in fact, rather in the condition of experimental knowledge than scientific knowledge?—It cannot be called scientific knowledge at all, because no one can rightly explain the reason of the process that goes on. The property which produces the effect is a compound of sulphur, but there are several of those compounds, and the real nature of the one which is efficient is not understood. No gas engineer knows how to meet it. He is subject at times to find himself entirely adrift, and to see circumstances arise that he does not know how to account for, nor how to remedy. I therefore consider that the three days average will be sufficient to form a sort of safety-valve, by means of which gas engineers can recover themselves.

Cross-examined by Mr. KINGSFORD: I will take it from you that the average of 2400 testings of the London gas has shown only 11·2 grains of sulphur, but I do not know that those figures are correct. I consider the gas-works at Maidstone to be strictly urban; the distance from the nearest house is only about 120 yards, and from the Town Hall about 1100 feet.

The CHAIRMAN said they must certainly be regarded as urban works.

Cross-examination resumed: I see no objection to the offer made by the Company of 20 grains and three days average, but I should not have advised them to make it.

Mr. KINGSFORD: From the evidence it appears that very great fluctuations occur in the amount of sulphur in the Maidstone gas?

Witness: But they could not then occur to any extent.

By the COMMITTEE: I am quite prepared to believe the sulphur goes up to 30 grains or even more.

Re-examined by Mr. POPE: In works like those at Maidstone the organization cannot, as a rule, be compared to London works. The Referees say that 25 grains is a fair standard for London in the winter time, and certainly gas makers cannot be better situated in Maidstone than they are in London, with all their appliances.

By the COMMITTEE: A maximum of 25 grains would occasion considerably more expense to the Company. The purifying material employed becomes dreadfully foul; the foulness, however, can be diminished, but it involves keeping the material a long time in the purifiers, and this involves the necessity of an increased amount of plant.

Mr. POPE said this was the case on behalf of the promoters.

FRIDAY, JUNE 18.

Mr. DUGDALE, on behalf of the Corporation of Maidstone, said that no Bill for the extension of the limits of a gas company had ever before been presented to Parliament backed by a smaller amount of evidence than that offered by the promoters of the present Bill. There was scarcely anything beyond suggestion or estimate. The only thing definite was contained in the evidence of Mr. Lawrence, who said that he would like to have the money of the Maidstone Gas Company expended in the extension of mains to Hollingbourne, so that he might be provided with gas at a cheaper rate than he could manufacture it for. With regard to the consumption in the districts proposed to be added, the only parishes which had been mentioned had small independent supplies of their own at the present time, but none of them had parliamentary powers; and Mr. West's evidence showed how vague and indistinct were his ideas with regard to the consumption of gas which might be expected; because at first he said it would be very small, and then afterwards he brought in an estimate showing a consumption of about 2 million feet per annum. Another point was that extensions ought not to be made unless they would pay—they ought not to be made out of the pockets of the consumers; and in order to attempt to show the Committee that it would pay, an estimate was produced of the cost the promoters thought would be incurred in carrying out their scheme, which was simply confined to an extension of their mains from the end of their present district to the gasholders in the four different places where there was already a supply in existence. This estimate of expenditure was, however, altogether insufficient, because it was quite certain that, if the Company obtained the powers sought for, they must be in a position to lay down more mains, and to add to the places which were supplied at the present time. The companies or individuals who at present had the supply in these districts had no parliamentary powers; they could not break open the public roads to lay down more mains; they practically could not do anything without the consent of the Local Authorities; and it did not appear how far those Local Authorities did or did not consent to the present application. Therefore, if the Maidstone Gas Company were to be able to work their new district, they must do what seemed to be the object of the owners of those small undertakings—viz., buy them up, and expend money in affording the districts a new supply; and really no idea had been given of the capital required for this purpose. The extra shilling proposed to be added to the price of the gas was not shown to be sufficient, because the Committee had not been told what, in reality, the increase of expenditure in making the extensions would be. The second point was of more practical importance, in the interest of the public, than the first—viz., how much additional capital the Company were to have; and it was not the practice of Parliament to allow gas companies to provide themselves so liberally that they would be enabled to escape parliamentary supervision for more than a reasonable number of years.

The CHAIRMAN: Ten years is the time placed before us.

Mr. DUGDALE said a table had been produced in which it was stated that it would be necessary to spend £50,000, in round numbers, during the next ten years.

Mr. COOPER said the filled-up Bill showed that £50,000 was the sum which the Gas Company might be required to expend within one year from the passing of the Act, and the remainder of the £80,000 was to be raised in sums not exceeding £10,000 in any succeeding year.

Mr. DUGDALE said it would be necessary to criticize some of the items in Mr. West's account. The first was that of land, but the Corporation thought it might be wise for the Company to acquire this land in view of the extension of the works within reasonable limits, and therefore nothing much need be said on this point. The next item was that of a new gasholder and tank, which the Corporation said would not be fully required, of the size proposed to be made, for the next ten years; or, if it was required, would not cost anything like the £12,000 which had been put down for it. The petitioners, however, contended that a gasholder of 200,000 feet, or, at the outside, 300,000 feet capacity, would be all that was necessary; and they also said that additional purifiers were not required. It was true that Mr. West and other witnesses had said they were needed, but when the Committee came to the evidence of Mr. Spice, they found he said quite the contrary—that the difficulty was not one of the capacity of the purifiers, but the want of chemical knowledge; and this remark would be substantiated by evidence. It would consequently be shown clearly and distinctly that this matter of purification was simply and solely a question of care and caution, and that the large expenditure which the Gas Company had made upon their works during the last four years had supplied them with purifiers amply sufficient for some time to come. The sum of £7000 for this item must therefore either be struck out or be subject to very considerable modification. "New offices, £3000," might seem a large sum, but might be generally assented to. The next item, "Mains in the town and outside," had been divided into £2000 inside and £4000 outside; and therefore if the Committee cut off the extensions the £4000 would go altogether. "Working capital" was put down at £7000; but why was this wanted? If such a sum was required, one would expect to see something in the revenue account for interest paid to the bankers; but there was no item of the kind, and, therefore, it was clear that the money was not required. With regard to the amount overdrawn at the bank, this was a sum which had been expended on capital account when there was no capital to meet it—viz., in the three or four years occupied with the reconstructions, and which ought to have been repaid out of the £5000 remaining as balance after payment of the dividends on June 30, 1879. If not devoted to the payment of this sum, it was open to the question put to one of their witnesses, to the effect that the Company had been paying dividends without paying their debts; and if they had paid their debts they would still have been able to pay their dividends, because they would have paid their debts out of this balance of net profits. Such being the case with regard to additional capital, it came to the point that the £48,000 was brought down very considerably—probably £20,000—and if the Committee said that £28,000 would be quite sufficient for all future as well as present requirements, and quite as much as the Company ought to have under the present Bill, they would be dealt with very liberally. The most important point of all, however, was the standard price to be charged for gas, because the Company now were bound by a hard and fast line. If they made more than sufficient profit to pay their maximum dividends, they were bound by law to give the consumers the benefit of this profit; but they had not done so, and now they were seeking to be placed under the auction clauses, which had turned out to be more beneficial to gas companies than people thought they would be. In order, however, to make those clauses fair to the consumers, the Company ought not to be placed in a much better position than they were in at present, so that they might be enabled to divide largely-increased profits, and have the additional capital besides. The question of standard price depended entirely upon the actual present position of the Company, which was that in 1879, with a price of 3s. 3d. per 1000 cubic feet, they were enabled to pay their maximum dividends, with the exception of a small sum, which was put by their own witnesses at 1d. per 1000, making 3s. 4d.; but he (Mr. Dugdale) could not quite make out how they arrived at this conclusion, because when he looked at the accounts for the year he found the balance carried to profit and loss was £3691, while the dividend for the previous year was £3548. On the first blush, therefore, it appeared as if the balance carried to profit and loss account on June 30, 1879, was more than sufficient to pay the maximum dividends on their capital.

Mr. COOPER said this amount did not include the interest on borrowed money.

Mr. DUGDALE said he was going to remark that he supposed there was the interest on the £10,000.

The CHAIRMAN: Should you not for this purpose deal with the maximum dividends upon the capital set forth in the preamble—viz., 10 per cent.

upon £12,500, which is £1250; 4 per cent. upon £12,500, which is £500; and 7½ per cent. upon £25,000, which is £1875?

Mr. DUGDALE said he thought it was hardly necessary to go into detail upon this.

After some conversation,

The CHAIRMAN said that the maximum dividend was £3625, and more than that could not, under any circumstances, be paid. Less had been paid in the previous year, the whole of the capital not having then been called up; but if the maximum dividend and the maximum capital was taken, it would show the extreme limit of the charge against the net profit.

Mr. DUGDALE said this was true, and in June, 1879, the revenue account showed "Balance carried to profit and loss account, £3691." The charge for gas that year was 3s. 3d. per 1000; and this was the starting-point from which he commenced—that 3s. 3d. was enough to pay the maximum dividends, and not 3s. 4d., as erroneously stated by the witnesses for the Company. He then turned to the question of repair and maintenance of plant, and he thought he should be able to prove that the average for works in such good order and condition as those at Maidstone would be 6d. per 1000 feet. The amount in 1879 was 13d., and, therefore, supposing he reckoned 6d. for extraordinary renewals, and 7d. for ordinary renewals, that would knock off 6d. for an ordinary year, and bring the price down to 2s. 9d., at which price the Company would be able to pay their maximum dividends. The Corporation then began to ascend the scale again, and ask the Company to do more than they had hitherto done—to give 16-candle gas instead of about 14½-candle. Of course it was a question of expense, which the Company said would be 3½d. per 1000, but which the Corporation said would be a little less; at any rate, they would say 3d., which brought the price up to 3s. But the Corporation wanted more than this—and this was one of the most important of their requirements—they wanted the Company so to purify their gas that there should never be more than 20 grains of sulphur in 100 feet of it. The promoters said that in order to do this they must erect additional purifiers to the amount of £7000, which was equal to 1d. per 1000 feet more in the price of gas; but this the Corporation would agree to, although they did not consider such additional works were needed. The Company next said they must have an addition of 5d. per 1000 feet for interest on new capital to be raised. Upon this point the Corporation said, "You have no right to anything, or only to a very small amount. In the first place, you do not require so much capital as you say; and, in the next, you have no right to expend a large amount of capital without producing a commensurate return, and this additional return ought to compensate for the amount of capital so laid out." The Company, in reply, said the capital would have to be expended at once, and compensation was therefore required for the loss that might arise until the additional income began to accrue; but an extra 5d. to their standard price appeared on this account to be quite exorbitant, and he (Mr. Dugdale) thought 1d. would have been ample. Taking it at 1d. brought the price to 3s. 2d., with 16-candle gas and a limitation to 20 grains of sulphur. The Company were, no doubt, entitled to something beyond this, because some reasonable allowance must be made for years when the price of coal might rise, although coal mines were being opened day after day, and the probability was that prices would never rise to anything like the extent they did at the time of the coal famine. Making all these allowances, if the Committee fixed 3s. 6d. as the standard price, and required the Company at the same time to supply gas of an illuminating power of 16 candles, with the limitation of 20 grains of sulphur, they would very soon begin to declare increased dividends. The next point was the illuminating power, but this was only a matter of price, and no doubt if an extra quality was paid for it would be given.

The CHAIRMAN said there was another ingredient—the improvement of the burner, which would also improve the quality of the light.

Mr. DUGDALE said this was so, and if all the consumers were to exchange their old burners for the improved ones they might be enabled to obtain a better light, although the article manufactured would be very much the same. Next came the question of purity, which was one of very great importance indeed. The last suggestion made before the Committee was that there should be 20 grains of sulphur present on an average of three days. The presence of sulphur in gas was entirely a question of care and caution in the manufacture, and it would be most unsatisfactory if a company were able to bring forward the tests made on three days—on two of which there were 10, and on one 40 grains of sulphur in the gas—and say they had complied with their Act, when the day the test showed 40 grains would be that of the greatest nuisance to those who had to consume the gas. The Committee would be informed by evidence that in places where the sulphur limit was 20 grains per 100 feet, the companies were obliged to take a considerable amount of care and exercise great caution so as to reduce this impurity to something like 10 grains. Therefore it was not an impossibility, and why should the Maidstone Company be allowed an average of three days, when, with ordinary care, they could control the sulphur all the year round?

The CHAIRMAN: Because at Maidstone they say they cannot get such clever fellows as they have in London.

Mr. DUGDALE said it was only a question of small expense. He was not authorized to speak on this point, but his firm impression was that if the Corporation could make sure of having a limit of 20 grains, they would be willing to pay a little more for the gas. It was very important that gas should be kept as free from sulphur as possible; and the Corporation hoped they would not be placed in a worse position with reference to this matter than other towns were. Then came the subject of testing, but upon this point the promoters appeared to be prepared to concede what was required. Mr. Stevenson said he did not think it important that notice should be given.

Mr. COOPER said the present testing-place was objected to.

The CHAIRMAN: If you can agree upon this point, we had better not have any contention about it.

Mr. DUGDALE said there would be no difficulty, provided the testing could be done without notice. The last question related to the reserve-fund authorized by the Gas-Works Clauses Act, 1847, and which he contended was quite sufficient; but the Company had also inserted a clause (17) for the formation of an insurance-fund in addition, which was totally unwarranted and unnecessary, and was therefore objected to altogether. There was also a power sought for to apply any excess of profits, over the standard rate, to the credit of divisible profits in the following year, which meant that if the Company's charge for gas brought in more than sufficient—it might be a great deal, or only a little—to pay the dividend they were entitled to in respect of such charge, instead of reducing the price, they were to keep it in their pockets, and thus be enabled to accumulate a reserve-fund, under the name of divisible profits, to an unlimited extent. This was a very ingenious thing, and the gentleman who drew the clause deserved credit for it; but he (Mr. Dugdale) did not think the Committee would sanction it.

The following evidence was then called on behalf of the petitioners:—

Mr. *Charles Ellis*, examined by Mr. KINGSFORD.

I am an Alderman of the borough of Maidstone, and have been Mayor three times. I was present at a meeting of ratepayers, called under the provisions of the Borough Funds Act, on March 9, at which it was decided to oppose the present Bill, in the interest of the gas consumers. The Corporation appointed a Committee some time ago to watch the action of the Gas Company, because of the complaints that had been made as to the quantity of sulphur in the gas, and also occasionally of the poorness of the light. In my own experience I have had reason to complain.

The CHAIRMAN: Perhaps your supply-pipe is not large enough.

Witness: It is not my fault if it is not. I have sent to the Company from time to time to have it remedied; and as to the sulphur, I have complained that cornices and so forth were damaged. Also, that when I went home of an evening, I could not only smell but taste the gas, which I attributed, whether rightly or wrongly, to an excess of sulphur in it. Dr. Adams, the Medical Officer of Health, is also the Gas Analyst, and his reports are handed in to the Gas Committee of the Corporation once a fortnight.

Mr. KINGSFORD: When speaking of injury caused by the gas, were you referring to any damage done to the stock in your business?

Witness: No; but it does affect goods placed near the ceiling.

The CHAIRMAN: But your complaint is that when you arrived home in the evening you smelt and tasted the gas?

Witness: Yes; it spoilt my appetite.

Examination resumed: I know the outlying districts proposed to be included under this Bill; and in my opinion there has not been any real need expressed or felt by the inhabitants in favour of the present measure.

Cross-examined by Mr. COOPER: My complaint is not that I do not get light enough, but that I get too much smell, which I suppose is sulphur, because it tastes like it. I have frequently had cause of complaint, especially in the winter, but the smell has not been so bad during the last month or so. I cannot fix any particular date when I have tasted the gas so badly, but it is an ordinary occurrence. The only meeting recently called in connection with the gas question was the one to which I have referred; but four or five years ago there were some meetings held on the subject, although I do not think any action was taken by the Corporation. Communications have taken place between the Corporation and the Gas Company with reference to complaints regarding the illuminating power and purity of the gas, which can doubtless be produced if necessary.

Mr. *Horatio Richard Cutbush*, examined by Mr. KINGSFORD.

I am an Alderman of the borough of Maidstone, and was present at the meeting which has been referred to. I am the proprietor of the *South-Eastern Gazette*, and at my place of business the whole of the men have complained very much indeed of the impurity of the gas, and also of its illuminating power. I agree with Mr. Ellis that complaints have been general and frequent in the borough.

Cross-examined by Mr. MICHAEL: The size of the room in which my men work is between 50 and 60 feet long by 15 to 16 feet wide. About 28 or 30 burners are in the room, but I do not know when those burners were examined; there are, however, never more than 18 burning. I have never personally made any complaint to the Gas Company.

Mr. *Matthew Algernon Adams*, examined by Mr. KINGSFORD.

I am a Fellow of the Royal College of Surgeons, and also of the Chemical Society. I am Medical Officer of Health for the borough of Maidstone, and was appointed Gas Analyst in 1876. Since that time I have presented fortnightly reports as to the quality of the gas, although I have made many more than fortnightly testings. The average illuminating power during the last 4½ years has been 14·8 candles, and the average amount of sulphur per 100 feet has been 25·87 grains. The maximum amount was on Aug. 28, 1877, when it was 53·55 grains, and the minimum was on June 26, 1879, when it was 8·51 grains. I have often heard complaints as to the sulphur, which I consider to have been reasonable. In testing for illuminating power I use one of Sugg's No. 1 "London" Argand burners, which gives a better result by 4 candles than the burner specified in the Act of 1858, which was the old Argand burner with 15 holes. In my opinion, therefore, a 16-candle limit would be a fair and proper one, as it would be restoring to the public their original rights. I think it is quite likely that there may be further improvements in the burners now in use. I consider a high illuminating power of gas important from a sanitary point of view, because poor gas produces more impurities as a result of its combustion than a rich and good gas. I specially reported to the Town Council on the question of sulphur in 1877, in consequence of the great complaints concerning the gas. That report explained, or I intended it to explain, not only the disadvantage of the impurity from sulphur, but also the difficulties which stood in the way of the accomplishment of purity. Similar complaints were general in the early part of 1879, my reports showing 45·3 grains on Jan. 29, and 42·4 grains on Feb. 8. The effect of burning gas containing so large a quantity of sulphur would be to produce a corrosive action on metallic surfaces specially, and also on textile fabrics, caused through the production of oil of vitriol.

Mr. MICHAEL said he should like to take the opinion of the Committee before going further into the matter. The promoters had offered terms to the Corporation, proposing that they should be limited to a certain quantity of sulphur; and, therefore, what was the use of entering into the question of the past, whether good, bad, or indifferent, but when they were under no restriction whatever.

The CHAIRMAN: We should have some evidence at hand, but not to be gone into at any length.

Mr. MICHAEL said the Company were willing to be placed under restrictions which were very uncommon; was it right, therefore, to occupy so much time in going into a long discussion, which had taken days and days in other Committees, and without any practical result when the main question was conceded?

The CHAIRMAN remarked that there appeared very little difference between the parties.

Mr. MICHAEL said that in London three days average was allowed, and his clients were quite willing that the same limit should extend to them, so that when any accidental circumstance occurred, opportunity might be given for looking into it.

Mr. KINGSFORD said there was a good deal of reason in his friend's remarks, the Company having admitted a limit of 20 grains.

The CHAIRMAN said the Committee were of opinion that it was wholly unnecessary to occupy time about the matter, bearing in mind the offer that had been made, and the admission of the Company that they must purify up to a certain point.

Mr. KINGSFORD said his scientific evidence would be addressed to the unreasonableness of the three days average.

Mr. MICHAEL (to witness): Do you say that there ought to be a more stringent regulation imposed than 20 grains of sulphur in 100 feet of gas, with an average of three days?

Witness: I am not in a position to form a proper and correct judgment upon that question, which is entirely a practical matter. The only way I can form an opinion is by looking down the daily testings which have taken place in London, and these show that the sulphur never runs up, speaking roughly, to anything like that amount.

By the COMMITTEE: Out of 2400 testings made at Beckton and at Friendly Place, Mile End Road, on only two occasions was the quantity of sulphur above 20 grains—viz., 21·1 and 20·6—and in both cases these amounts were satisfactorily accounted for as accidental.

Mr. KINGSFORD: From your knowledge of the works at Maidstone, is there any difficulty in keeping this impurity down to 20 grains?

Witness: That, again, is a practical question.

Cross-examined by Mr. MICHAEL: I am quite aware that sulphur cannot be kept down without means being taken to prevent it.

Mr. MICHAEL: That involves the difficulty of removing one nuisance by creating another, does it not?

Witness: I think the nuisance business, since it has been taken in hand, has been overcome.

As to the alleged difference of four candles in illuminating power, the test you use now is one universally adopted?—Yes.

I suppose no test could give more illuminating power than really exists in the gas?—It depends upon the instrument employed.

Take any instrument you like to employ?—That is mere sophistry.

The Committee will judge whether it is a fair question or not; can you answer it?—I believe burners will yet be devised that will give more illuminating power.

But can any burner, now or hereafter to be devised, give more illuminating power than is contained in the gas?—Of course not.

It is open to every consumer in Maidstone to use the same sort of burner as you have done, is it not?—With certain qualifications, yes; but it is too costly for the majority of people, the price being something like 7s. 6d. each.

Are there not flat-flame burners that give exactly the same illuminating power as Sugg's Argand?—I cannot answer. I am an analyst of gas, but not an analyst of burners.

Mr. *Thomas Hawksley*, examined by Mr. KINGSFORD.

I have been consulted at intervals by the Maidstone Corporation for about 25 years, and have been over the works of the Gas Company, which are in a very excellent condition; indeed, they are what may be called nearly new, but not complete in all respects, though nearly so. Another gasholder for about 250,000 cubic feet would be an advantage. It is not absolutely necessary for the present supply of gas, but it is requisite in view of an extension of the demand. I may here explain that in all towns of this magnitude, not being manufacturing towns under the Ten Hours Act, holders containing three-quarters of a day's supply are quite ample. The gasholders at Maidstone do contain about this quantity, but they are on the verge of becoming insufficient, and therefore I think that another gasholder of about the size I have mentioned would carry the Company on for probably the next seven years. The cost would be about £6000 or £6500, I should say.

The CHAIRMAN: The promoters of the present Bill are preparing for an estimated increased storeage of 500,000 feet, as against 250,000 which you state?

Witness: I think that is quite out of the question, and not good engineering either, because it is obviously better to have, in small works like these, two gasholders each of half the proposed size, instead of one gasholder of large size, which by accident might go out of use, and then nearly all the storeage would be lost; whereas if you put the same quantity of gas into two vessels, you would only lose one, besides you save the interest of the money for a great many years.

Examination resumed: I do not think additional purifiers are required. The new ones which have been erected recently are perfectly capable of purifying 1¼ million cubic feet of gas per diem. There are also six old ones of no mean size in themselves, but I do not reckon upon them at all. The four new ones are capable, with proper arrangement and intelligent management, of reducing the sulphur down to 16 grains as a maximum, although 20 grains ought, in my opinion, to be allowed as a margin. I have had as large experience in this matter as probably any person in England; but I would rather refer to the practical results of others who have been obliged to act under limitations imposed by Parliament. Take the case of Beckton. The sulphur impurity was reduced last October to an average of 10¾ grains in 100 feet; in November it was 12½ grains; in December it was 12½ grains; and during the whole of those three months in no one day did it exceed 18¾ grains. In January the average was 11¾ grains; in February, 11¼ grains; and in March, 11⅝ grains; the largest amount in those three months being 15·9 grains. In this case there ought not to be any difficulty arising from the suggested nuisance of removing the foul lime. Of course engineers and gas manufacturers will have their own notions about the proper mode of using oxide of iron and lime in gas purification. I need not say that purification by lime only is the best method, but it is quite common to use both—sometimes oxide first and then lime, and sometimes the reverse; but I have no doubt that the proper way is to use oxide first, so as to take out the sulphuretted hydrogen, and then afterwards to use the lime only for the purpose of taking out the bisulphide of carbon and the carbonic acid. All three elements of impurity can be perfectly removed by this sy tem, and by purifiers of much less size than those recently put down at Maidstone. Purification is too commonly left in the hands of ordinary workmen, and it frequently happens that the purifiers are so arranged that it is not impossible for a workman to make a mistake, or to use an erroneous discretion, or to be guilty of improper neglect. If the valves are so arranged that they can be used in any other order than the right one, it might happen that the workmen will pass the gas through the wrong purifier, and when this is the case the gas will go into the town in an imperfectly purified condition, and the consumers will be very much annoyed, because the air in their apartments becomes fouled, and goods and furniture, and metallic articles which gas is capable of attacking, will be seriously injured. I know that sulphuric acid is very extensively generated by the combustion of gas containing sulphur in any form; and I have collected in my own office very large quantities of the acid, almost accidentally, which has been produced in that way—so much so that I could have obtained a hogshead in a year.

Mr. MICHAEL: A hogshead of sulphuric acid?

Witness: No; not of pure sulphuric acid, but of water very strongly impregnated with sulphuric acid.

Examination resumed: I have not a word to say against the purifiers, but there is a better system, and if I had it here I could show how to absolutely prevent the risk of impurity getting into the town. The cost of purifying gas from sulphur down to the 20 grains would be 1d. per 1000 feet, independent, of course, of all interest on the capital expended in the construction of the purifiers. The item of £7000 for working capital is a very curious one. The shares ought to provide this working capital, but apparently it is not the practice here. It seems on an investigation of the accounts that the capital has been provided out of profits.

Mr. KINGSFORD: Consequently the Company are now in such a position of daily expenditure and receipts that the bankers do not require to charge them any interest?

Witness: I do not know what may be the case with regard to a current account. It is quite possible that at times the Company may overdraw, and at other times they may have money in their bankers hands; but upon the general principle of the thing the answer I have given applies.

Mr. MICHAEL: But there is a charge on overdrawn accounts?

Witness: When shares are sold by public auction, as proposed in this Bill, it is always possible to provide the bankers with sufficient capital to draw upon.

Examination resumed: With regard to the new capital, I think £50,000, with the ordinary borrowing powers in addition, would be ample, and would last the Company for ten years, at a rate of increase of 7 per cent. They have already provided for the payment of their works for a million feet of gas, and therefore to my mind they cannot spend £50,000 in ten years.

Mr. KINGSFORD: Coming to the standard price of the gas, I find from the Company's accounts for 1879 that they paid the maximum dividends with a charge of 3s. 3d. per 1000 feet?

Witness: Yes; and applying money to other purposes besides.

In 1879 the sum of £5820 was expended for repairs and maintenance; what, in your opinion, would be the average amount necessary to be expended on those items in future years?—The usual allowance is 5d. per 1000 feet; but I have allowed 6d., for the purpose of being somewhat in excess.

Say 7d.?—No; I will not, because it is not according to fact. They have charged 13d., which is certainly an overcharge of 7d.

What have they overcharged 7d. for?—Repairs and maintenance of works, no doubt; but they have been building other works, and have mixed their accounts.

So that from the 3s. 3d. we ought, according to your estimate, to take 7d., bringing it down to 2s. 8d. per 1000 feet, at which the Company could pay their present maximum dividends?—Yes.

Starting from that point, we require an increase to 16 candles; how much ought to be added for this?—Supposing it was a real increase, it ought to be 2½d. per candle, and this would make 5d.; but the same gas will give a different illuminating power according to the kind of burner used.

Then the Company ask to be allowed a percentage upon their new capital; what do you say to that?—I have nothing to say to it, because I do not understand it; it appears to me to be simply absurd. Supposing, however, they only erect the works now which are reasonably necessary for the next few years, they ought to have such a price allowed as would enable them to obtain 7 per cent. upon the outlay.

Taking all matters into consideration, what do you think would be a fair amount to allow in this case?—I would give them a standard price of 3s. 6d. per 1000 feet, which would be ample.

Examination continued: The question of illuminating power is only one of paying a little more, using a little more cannel, or drawing a little less of the weak gas out of ordinary coal.

Mr. KINGSFORD: In your opinion, is there any objection to the 20 grains of sulphur with a three days average?

Witness: I believe the three days average has never yet been granted, because it is a palpable absurdity; it condemns itself. I have shown that it is quite practicable to bring the amount of sulphur down to 10 grains, or even less; and the consequence of the three days average would probably be that in one day the Company's gas would contain 40 grains of sulphur, and stink the whole of the consumers out, while on the other two days there would be only 10 grains in it.

By the CHAIRMAN: Of course, by searching through Acts of Parliament a clause can be picked out to suit any purpose; but I do not know of an instance in which such a clause as is proposed in this Bill is inserted.

Examination resumed: Most of the places proposed to be included in the new district are very small; some of them contain only from 200 to 300 inhabitants.

By the COMMITTEE: There are 11 villages, with a population of 9764 persons, within the 3-mile radius, and 12 villages, with a population of 11,287, between the 3 and the 4 mile radius. The villages already supplied contain 5756 inhabitants, leaving 15,295 of the entire population unsupplied.

Cross-examined by Mr. LEIGH: I can give several instances of Companies being restricted to 20 grains of sulphur, because I have a list of this kind [referring to a paper]. The first which catches my eye is the Dublin Gas Company—20 grains, but no average clause. Then there is the British Gas Company. I was also Engineer for the Bill of the Newcastle-upon-Tyne Gas Company, in which there was a 20-grain restriction clause, both in their 1867 and also in their 1879 Act.

Mr. LEIGH said there was a restriction in the latter Act which was as follows:—"The gas supplied shall not, unless in the case of unavoidable cause, contain more than 20 grains of sulphur in every 100 cubic feet, as ascertained by the apparatus in use by the Metropolitan Gas Referees."

Witness: That was not an exception; it was simply a prescription, and if it is inserted in this Bill it will help the Corporation, and I shall be very glad to have it there. As penalties are to be inflicted, I think the clause is reasonable.

Do you see any objection to the words in the Shrewsbury Gas Act of 1878—"If on any one day the gas be of less purity or illuminating power than that prescribed by this Act, the average testing under this Act made on that day, and on the preceding day and on the following day, shall be deemed to represent the purity of that day"?—Very much indeed. It is a totally unusual, and a very improper clause; enacted by Parliament, I dare say, but not upon conflict.

But surely you cannot get over the fact that in the South Metropolitan Gas Act of 1876 the same clause was inserted, and likewise in the Chartered and Commercial Gas Companies Acts?—Not in the case of the Chartered Company. I have before said that where penalties are to be inflicted, many of the enactments are too stringent, and there ought to be always an exception for unavoidable causes.

By the CHAIRMAN: The clause which has been read is an absolute absurdity, because it defeats its object, which is to give the inhabitants, not "pure gas," but "reasonably pure gas"—that is to say, containing not more than 20 grains of sulphur.

Mr. LEIGH: As a matter of fact, do you not know that The Gaslight and Coke Company, the Commercial Gas Company, and the South Metropolitan Gas Company have a Bill in Parliament this year to make further provision for regulating the supply of gas by those Companies—or rather, the Corporation of London have promoted a Bill with this object?

Witness: I do not.

The CHAIRMAN: The Bill has not been before a Committee of this House yet, I believe.

Mr. LEIGH: No; it has been settled, by consent, between the Corporation of the City of London, the Metropolitan Board of Works, and the Companies, by the Board of Trade.

The CHAIRMAN said he thought it was scarcely a precedent for a Committee on a contested Bill.

Witness said the question in dispute was raised by a Bill brought in by two or three companies a few years ago, and rejected by Parliament.

Mr. LEIGH: Are not these clauses, which you say are so exceptional, re-enactments of the Metropolitan legislation with reference to gas companies since 1875 and 1876?

Witness: Certainly not; and I wish you could produce anything which would lead to that conclusion.

Is not the process for taking out the sulphur an uncertain one?—It is uncertain within certain limits, but not beyond those limits. There is no

difficulty at all; and what greater proof can there be than the results of the system adopted in London?

In The Gaslight and Coke Company's Act of 1876, and the South Metropolitan Company's Act of the same year, the three days average is allowed. Were not both these Acts based upon the Commercial Company's Act of the preceding year?—Allow me to read it [referring to the Act]. I see the clauses there have practically the effect you have mentioned.

Has not the three days average clause been allowed because the process for taking out the sulphur is too uncertain to permit it to be done invariably?—If you apply it to the 20 grains it is a mistake, but if you apply it to less than 20 grains it is not a mistake. Gas made from ordinary descriptions of coal can be regularly and uniformly purified within the limit of 20 grains by reasonable care and attention.

Do you not know that so far as the London Companies are concerned the Gas Referees actually allow 25 grains during six months of the year, and 20 grains during the other six months, and that is all we ask for now?—That was because the purifying apparatus was of the old sort, and not well adapted for the purpose within the limit I have mentioned.

But that is *plus* the three days average?—You do not understand the question a bit. The 25 grains are only temporary; the Companies will not be allowed that quantity when their apparatus is in proper condition.

You put the word "temporarily" upon me. Has it not existed since 1875?—Yes; because in most cases these old works are much in the same condition as they were then.

I am told it has existed since 1868?—I dare say it has.

Then I do not think it is quite fair to say I do not understand the question a bit?—I do not think you do, or else you would not keep putting such questions when I have told you what has happened practically. I have done it, and am still doing it in a great number of cases, and other people are doing the same.

In answer to the Chairman, Mr. LEIGH said his object was to ascertain why a Company in a country town was to be placed in a worse position than one in London.

Witness said he did not think this was the case.

Mr. LEIGH: But I say we are.

Witness: I do not admit it for a moment. If the London Companies were in as good a position as you, they would be very glad.

Cross-examination continued: The London Companies have a power of appeal to the Chief Gas Examiner, but it is in respect of unavoidable circumstances, and I think this power of appeal is perfectly just. In Maidstone there is no such officer, but there is an appeal to the Justices. It would not be an unavoidable cause if any mishap arose through negligence. In London the Chief Gas Examiner has refused to give a certificate on certain occasions, and penalties have very properly been levied upon the Companies in consequence. It is also quite possible that the Justices will allow relief to the Company if their cause is justified, and in that case they would be exonerated. I can give plenty of instances in which gas companies have had the restriction to 20 grains of sulphur imposed upon them all the year round. The first place which strikes me is Cambridge, where the clause was inserted in 1867, and there is no difficulty in working within the limits. The works there are just at the extremity of the town, and have very good buildings and schools around them. I cannot tell you the rateable value of the houses near the gas-works. Then there is the case of Weymouth, where I should think there must be an examiner, but I do not know who he is. I cannot say whether any reports are sent in of the quality of gas supplied to Cambridge; I do not see them. I certainly say that a suburban company should be placed under as great a restriction with regard to sulphur as an urban company.

Mr. LEIGH: Will you grant that if we are placed under a 20 grain limitation clause it will be necessary that our purifiers should be in the very best order?

Witness: That is a question I do not comprehend, because purifiers are of a common iron construction.

Mr. LEIGH: We should, at all events, have to put up new purifiers?

The CHAIRMAN: No; Mr. Hawksley has stated that the purifiers are sufficient, and in excellent order.

Mr. LEIGH: That is a total contradiction of the evidence given by our General Manager?

Witness: If your General Manager has said that without qualification, I do disagree with him.

The CHAIRMAN: Mr. Hawksley says the existing purifiers can reduce the sulphur to 16 grains, and that no additional ones are required.

Mr. LEIGH: In eliminating or reducing sulphur to 16 grains, what do you add by way of expense? Do you give us 1d. per 1000 feet for that in the standard price?

Witness: I have included it in the standard price as being part of your ordinary expenditure.

I asked the question not on my own authority, but on that of Mr. Livesey, who said: "I have considered the question of price to this extent, that a certain standard is sufficient without restrictions, but they would require 2d. per 1000 feet more with those restrictions"?—I do not know what he means—if he means all restrictions.

The CHAIRMAN: No; he means expressly 20 grains.

Witness: It is perfect nonsense. The whole course of purification, so far as respects the purifying materials, is under 1d. anywhere.

Mr. LEIGH: Mr. Livesey is a great authority on this question, is he not?

Witness: Not if he said that.

Cross-examination continued: The South Metropolitan Company are so flourishing that they are enabled to sell gas, and purify it, at 3s. per 1000 feet, and I believe their £100 shares stand at £205. I cannot say what the Maidstone Company's shares will fetch if they do their duty properly, and if they are subject to what counsel call restrictions, but which I only call obligations to do their duty properly.

Mr. LEIGH: Is it owing to Mr. Livesey's good management that the South Metropolitan Company has been developed in the way it has?

Witness: I cannot answer such a question as that with regard to another professional engineer.

Mr. LEIGH: But you say he talks nonsense.

The CHAIRMAN: Mr. Hawksley qualifies that by saying the nonsense is what he said on a particular point.

Witness: Yes; that they required 2d. per 1000 feet to purify gas properly, when it is done everywhere else for 1d.

Mr. LEIGH: There is 1d. for capital and 1d. for the removal of the sulphur compounds; this is how the 2d. is made up?

Witness: That is an obvious mistake. One penny represents exactly £450, of course at 5 per cent., which is the expenditure upon purifiers additional to what they have, and which would be something like £9000. The whole of the purifiers together did not cost one-third or one-fourth of the money; so the matter does not bear reducing to calculation.

[At this stage of the proceedings the further cross-examination of the witness was postponed till the following Monday.]

CLAY CROSS GAS SUPPLY.—It is stated that the Clay Cross Local Board have made an offer to the local Gas Company to purchase their works for £12,000, which is just double what they cost.

Legal Intelligence.

SALFORD HUNDRED QUARTER SESSIONS.—WEDNESDAY, JULY 7.

(*Before Mr.* W. H. HIGGIN, Q.C., *and a Bench of Magistrates.*)

THE STRETFORD GAS COMPANY AND THEIR ACCOUNTS.

It may be remembered that, at the April sittings of the Court, a Mr. W. Aldred, of Manchester, was appointed to examine the accounts of the Stretford Gas Company, and to report upon them, in order that it might be determined whether or not a reduction in the price of gas could be ordered.

Mr. TAYLOR, now as before, appeared for the petitioners upon whose request Mr. Aldred was appointed; while Mr. NASH represented the Company.

Mr. TAYLOR said he appeared on behalf of a number of ratepayers of Stretford and the district, in an action brought by them against the Stretford Gas Company under the Gas-Works Clauses Act, 1847, relative to the price charged for gas and other matters connected with the Company's affairs. The case had been fixed for hearing, and he asked if it would be convenient to proceed with it at once.

The CHAIRMAN said he had looked over the report Mr. Aldred had made, but he did not think it was sufficient. What the Court required was that there should be a balance-sheet prepared for every year which was covered by the report, to show what was the condition of things upon those balance-sheets under the provisions of the Gas-Works Clauses Act—that was to say, allowing in each year 10 per cent. for dividend, what was the balance which ought to have been in the hands of the Company, and what ought to have been the price of gas to the consumers.

Mr. TAYLOR: The balance-sheets presented are those which by Act of Parliament the Company are bound to send to the proper authority.

The CHAIRMAN: What the Court requires is that a competent person should show from the accounts of the Company, by separate balance-sheets for each year, what ought to have been the price of gas to the consumers.

Mr. TAYLOR: What I have to direct your attention to is this, that the actual state of things is shown upon the schedule of accounts sent in by Mr. Aldred. This shows that the Company have misappropriated and paid beyond the limited percentage allowed by their Act of Parliament £17,000. That is what appears on the accounts.

The CHAIRMAN: But it does not show what the price of gas ought to have been in each of the years covered by the report.

Mr. TAYLOR: What I submit that the Court has to inquire into is this, and nothing more, not what the actual state and condition of things was in various and previous years, but the actual state and condition of things at the time when the matter came before the Court. This is shown upon Mr. Aldred's report and upon the schedule of accounts. It appears upon Mr. Aldred's report, according to the present price of gas, what the difference would be. A sum of £5000 has been credited to the undertakers, and upon it a dividend has been paid to the extreme limit of the Company's Act of Parliament; and then further there has been distributed as a bonus £7800, which, of course, is also in express violation of the Act of Parliament; and in addition to this they have paid dividends free of income-tax, likewise against the Act of Parliament, amounting to £1000.

The CHAIRMAN: There are gentlemen on the other side who are going to call a number of accountants in conflict with Mr. Aldred's statement.

Mr. NASH: This is an ingenious version or gloss put upon certain figures. Anything can be done with figures, as you know.

The CHAIRMAN: Practically it will come to this. The matter must be inquired into.

Mr. TAYLOR: Yes; and what I submit is that this is the proper time to inquire into it.

Mr. NASH said his clients desired that the matter should be fully inquired into, and Mr. Aldred's statement would be answered by Mr. Locock Webb, Q.C., who had been called in by the Directors of the Company. He denied entirely that there had been any misappropriation whatever. The Directors had done work themselves, for which, if they liked, they might have called in highly-paid services.

Mr. TAYLOR: And they have received £400 a year for it.

The CHAIRMAN: It does not follow that, if they have saved £50,000 a year by doing the work themselves, they have a right to divide, either directly or indirectly, more than 10 per cent.

It was then agreed to take the case on the 6th of October next.

WOLVERHAMPTON PETTY SESSIONS.—MONDAY, JULY 12.

(*Before Messrs.* G. L. UNDERHILL, W. H. ROGERS, M. IRONMONGER, *and* E. DIXON.)

THE USE OF FOUL GAS LIME IN AGRICULTURE.

John Spiers, a toll collector on the Stafford Road, was summoned by Mr. Samuel Cliffe, a farmer, for taking 6d. as toll for two horses and a cart, which it was claimed were exempted from toll on the ground that the cart contained gas lime required for the improvement of agriculture.

Mr. E. H. THORNE appeared for the Complainant, and Mr. R. A. WILLCOCK defended on behalf of the lessee of the tolls.

Mr. THORNE briefly explained that the point in dispute was whether "gas lime" came within the exemption clauses of the Turnpike Acts. The gas lime was in reality a sulphate for the improvement of agriculture. It was not used on the land alone, but was generally mixed with soil and manure heaps before it was distributed over the land.

Complainant was called, and spoke to sending his man for a load of gas lime to the Stafford Road works of the Wolverhampton Gas Company, and the demand of the defendant for 6d. for toll, which he paid under protest. He said he never paid tolls for loads of gas lime until the defendant took charge of the gate in question. He mixed the gas lime with refuse from ditches, &c., and it had the effect of destroying all the weeds. He also frequently mixed the gas lime with manure, and then distributed it over the land to enrich it. Pure lime was the best, but gas lime was both cheaper and more easily obtained.

Mr. *E. W. T. Jones*, the Borough and County Analyst, and also Analyst to the Staffordshire Agricultural Society, described the process which lime underwent for the purification of gas, and its application to land. Pure lime was, he said, necessary for the fertility of land, and gas lime, which contained traces of ammonia, was used for no other purpose than as a fertilizer of land. In combination with manure it furnished sulphur, and so became valuable for the cultivation of land.

Mr. WILLCOCK, for the defence, contended that neither pure lime nor gas lime was exempted from toll.

Mr. THORNE said the main question was whether gas lime was "lime," or a chemical only for the purpose of improving the land.

Mr. ROGERS said he had been connected with the Turnpike Trust for 25 years, and had never before heard of toll being taken for gas lime. The late lessee never charged for it.

Mr. WILLCOCK said a similar case had been decided at Monmouth in favour of a lessee of tolls there.

Mr. ROGERS pointed out that while gas lime was used for no other

purpose than manure, farmers might draw pure lime, and say it was for their farms, when in reality they might want some of it for use on the land and the other for building purposes. So far as he was concerned he knew that it was always intended that gas lime should be exempted from toll, and he would take care to have it exempted in the next lessee's agreement.

The Bench were unanimously of opinion that gas lime was "a manure," but as this was a test case they only fined the defendant a nominal sum of 1s. and costs.

Mr. THORNE said he found that in the Monmouth case referred to by Mr. Willcock no analyst gave evidence.

Miscellaneous News.

EUROPEAN GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held at the London Offices, Austin Friars, last Wednesday—WILLIAM WHITE, Esq., presiding.

The CHAIRMAN, in opening the proceedings, said: I am very sorry to inform you that Mr. Dozell's health has prevented him from acting as Secretary for several months past, and, pending other arrangements, Mr. Backler will officiate on this occasion, and I will now ask him to read the notice convening the meeting.

Mr. BACKLER having accordingly read the notice, he also read the following report of the Directors, and the audited accounts and balance-sheet of the Company for the year ending March 31, 1880:—

The relapse in trade, which deceived many expectations, founded on the activity that prevailed for a limited time, has affected the interests of this Company to some extent, by preventing a general increase in the consumption of gas.

In some cases the falling off in rental has proved to be considerable, Bolbec having suffered a reduction of 15¼ per cent., and Amiens 7 per cent.

The aggregate increase at the seven stations is, however, at the net rate of 3 per cent., notwithstanding the severe frost of last winter, which prejudicially influenced the Company's business.

In several localities the mains suffered material damage from the same cause, whereby leakage was increased, and much trouble and expense incurred to cure the evil.

In the latter part of last month a sewer at Boulogne burst, on a length of about a quarter of a mile, and occasioned serious injury to several of this Company's pipes. An official inquiry is now being conducted to ascertain the cause of the accident, and to fix the liability for compensation.

On March 31, 1879, the total net profits at the stations were £62,007 2s. 7d., and on the 31st of March last they amounted to £64,787 10s. 3d.; showing an increase of £2780 7s. 8d.; to which must be added a reduction in the debenture interest of £890 3s. 2d.; total surplus, £3670 10s. 10d., after making ample provision, as usual, for every contingency that could be foreseen.

The favourable terms on which coals were obtained throughout the year contributed in no inconsiderable degree to this result. On the other hand, some additional expenses were necessarily incurred, especially for wages, to satisfy demands which the Directors found it impossible altogether to reject.

It is gratifying to remark that, whilst passing through such difficult times, the bad debts of the year amount to £191 only at all the stations.

At Nantes the excavation of a tank, to receive the proposed new gasholder, is proceeding but slowly, owing to the difficult nature of the ground; but all other extensions previously referred to as in progress at that station are about to be completed.

The auxiliary works at Sotteville, near Rouen, are in course of construction, and it is intended to bring them into operation in time for next winter's requirements.

The Directors see no present need to incur any large expenditure of capital, and venture to anticipate that the advantages of past outlay will soon be materially appreciable in the shape of improved returns.

For many years past this Company has supplied gas consumers with fittings and stoves on moderate terms, so as to reduce to a minimum the preliminary expense attending the first use of gas. Such facilities have been further developed during the past year. Show-rooms have now been opened in the most frequented parts of the towns lighted by the Company, gas-engines have been introduced and placed in considerable numbers; and, generally, energetic efforts have been successfully made to attract attention to the great advantages of gas for lighting, heating, cooking, and as a motive power.

The use of coke has also been popularized and extended by adapting it to the wants of purchasers; the system of breaking it into small pieces, by machinery, already partially practised by this Company for some years, being now more generally adopted.

The manufacture of sulphate of ammonia has likewise become a source of increasing profit, owing to the improvements effected from time to time.

The Shareholders will observe that an intelligent spirit of progress pervades the various departments of the Company's business, and the Directors believe that this must tend not only to maintain the undertaking in its present efficient state, but to secure still greater advantages in the future.

Under these favourable circumstances they recommend the declaration of a dividend of 22s. per share on the paid-up shares, and in the same proportion on those only partially called, all free of income-tax; leaving a balance of £3880 9s. 9d. to be added to the reserve of undivided profits.

Two of the Directors—William White, Esq., and Henry Solomon, Esq.—and both Auditors—George Harrison, Esq., and Edward Garey, Esq.—who will retire from office at this meeting, have given notice of their intention to offer themselves for re-election.

The CHAIRMAN: Gentlemen, it becomes my duty now to move the adoption of the report and accounts which you have had read to you, and to make a few remarks upon the report, which you all see is rather favourable. The opening of the report seemed to be of rather a gloomy character, but if that impression was produced on your minds, it must have been removed by the sequel. We have been disappointed in the reduction in the consumption of gas in December and January, but, on the whole, we consider our business to be in a very satisfactory condition. I have frequently remarked that it is a great advantage to us to have several stations, because, as a general rule, a falling-off in one or two of them is compensated by improvements in the others. This is signally the case with respect to the past year, where the effect of the suspension of lighting in many factories has been more than covered by the improvement realized elsewhere, and I may say that the energetic means we have used to push our business has been the main cause of this favourable result. In localities where our mains could not be laid at a great depth—in some French towns there are a great many arches underneath the streets, and this prevents us from laying our mains as deeply as we could wish—they suffered severely from the changes of temperature during last winter; but we have had all the weak parts inspected and repaired where necessary, and I think the increase of leakage which caused us some uneasiness is not likely to continue much longer. Of course, we are subject occasionally to such contingencies and accidents as these, and must meet them as they occur. The frost also had the effect of freezing the water in such a large number of meters, that many consumers, with Oriental apathy, made up their minds that they were the victims of Fate, and instead of adopting means to free their meters from ice, quietly resigned themselves to use oil and candles until the thaw came. The servants of the Company not having the power of ubiquity could only attend to a limited number of consumers at one time, and so from one reason and another the rental for the months of December and January suffered severely. It is not likely that such sharp weather will often recur, and, therefore, we shall have a much larger consumption during the winter months. I do not think the other parts of the report require much comment from me. You will see that they afford evidence of present prosperity, and encourage us to hope that this will not suffer any diminution in the future. If in the bad times, from which we have not yet emerged, we have succeeded in doing so well, we have every reason to believe that the better times, when they come for others, are not less likely to be satisfactory to ourselves. If there are any other points in the report or the business of the Company generally on which any further information is desired, I shall be happy to answer any questions or hear any remarks. I now move—"That the report of the Directors and the accounts now read be received and adopted."

Mr. SOLOMON seconded the motion.

Mr. R. JONES said he was rather disappointed at the Chairman's remarks as to the reduction in the consumption of gas in December and January being attributable to a want of proper diligence on the part of the officers of the Company.

The CHAIRMAN: I did not say that.

Mr. JONES said that this was the interpretation he put upon the Chairman's remarks. It seemed to him (Mr. Jones) that greater vigilance should in future be given to the meters, in the event of a severe winter. He thought it rather matter for congratulation that there had been a severe winter, because he had on former occasions heard the Chairman complain somewhat bitterly of the mildness of the winter preventing the Company getting rid of all their coke. Now he complained that, with a more severe winter, there had been a reduction in the consumption of gas.

Mr. WHITEFORD pointed out that the remark of the Chairman was, that the officers of the Company could not be ubiquitous, which implied that where they had had the time and opportunity they had given their services to meet the difficulty which arose.

The CHAIRMAN: It would never answer our purpose to keep a much larger staff than is generally necessary, simply to meet a case of severe frost; but we did the best we could at the time.

The motion was then put, and carried unanimously, as was also one for the declaration of the dividend mentioned in the report.

On the motion of Mr. CHALONER SMITH, seconded by Mr. ROAN, Mr. W. White was unanimously re-elected a Director.

The CHAIRMAN, in returning thanks for his re-election, referred to his having been a Director of the Company for something like 31 years, and said that ever since he had had anything to do with it the Shareholders had been almost unanimous in re-electing him whenever his time for retiring came round. He thought, therefore, that they had been satisfied with the management of the Company. He then moved the re-election of Mr. H. Solomon as a Director of the Company.

Mr. E. F. WHITE seconded the motion, and it was carried unanimously.

Mr. SOLOMON having expressed his acknowledgments, the retiring Auditors were also re-elected.

On the motion of Professor TAYLOR, seconded by Mr. FEARIS, a vote of thanks was unanimously accorded to the Chairman and Directors.

On the motion of Mr. PEILL, a vote of thanks was passed to Mr. Backler, for having fulfilled the duties of the absent Secretary.

The CHAIRMAN: First of all I would thank you in the name of the Directors for passing this vote of thanks to them and to myself. As I have often said, the Directors endeavour to do their duty. We work well and harmoniously together, and you, as Shareholders, see the result of our working. I think you are all satisfied that we work advantageously in the interests of the Company.

Mr. BACKLER expressed his gratitude at the vote of thanks that had been passed to him, which, filling as he did the dual position of Director and General Manager, he accepted not only for himself but for all the officers of the Company. With regard to the special occasion which had brought this motion forward, he very much regretted the absence of his friend Mr. Dozell. They had worked cordially together for 24 years, and there had scarcely been a day on which Mr. Dozell had been absent from illness during that time. He was in some measure his (Mr. Backler's) own pupil, for he had trained him from very early days to fulfil his duties, and he fulfilled them remarkably well till illness struck him down. He did not despair of his further assistance, but whether they had it or not the Shareholders might rely upon it that the business of the Company would be conducted in such an efficient and regular manner as to ensure its success. He was most ably seconded by the staff in every department, both at home and abroad, and it was really a pleasure to resume former duties and put on harness again, as he had done, after an interval of some years, surrounded by a zealous staff, who were willing to do everything which he considered necessary for the benefit of the Company, and to do it in the most harmonious manner.

The proceedings then terminated.

SOCIÉTÉ TECHNIQUE DE L'INDUSTRIE DU GAZ EN FRANCE.

[Abstracted from *Le Journal des Usines à Gaz.*]

The Seventh Annual Meeting of this Society was held in the Hall of the Society of Civil Engineers, Paris, on the 21st, 22nd, and 23rd ult., under the presidency of M. JORDAN. There was a very good attendance of members.

The proceedings opened on the morning of the 21st with the transaction of the usual routine business, on the conclusion of which the names of the gentlemen who had applied to be admitted as Ordinary Members or Associates of the Society were put to the meeting, and approved of. Of the former there were 27, and of the latter 10.

The PRESIDENT remarked that the members of the Society had been invited to a conference to be held by M. Jamin, a Member of the Institute, on the following evening; he further stated that the Paris Gas Company had given permission for the members to visit the new works in course of construction at Clichy, where arrangements would be made to render the visit as interesting as possible. This visit was to take place in the afternoon of the 23rd. He then proceeded to deliver his Inaugural Address, the chief points of which we may shortly have an opportunity of laying before our readers.

The address was received with applause.

The TREASURER (M. Foucart) presented his report on the financial position of the Society, and it was unanimously approved of.

M. LECLERC then read a report on the subject of the prizes to be awarded by the Society. It stated that with reference to the sum of 4000 frs. (£160) which it had been agreed to award to the authors of the best papers on any subject specially connected with the gas industry, the Committee recommended that the sum of 1000 frs. (£40) should be given to the author of the only paper sent in, which bore the motto "*L'Union fait la Force*," and the title of which was "On the Construction of a Telescopic Gasholder." "With regard to the premium of 1200 frs. (£48) which was to be shared between the authors of the two best papers presented at the meeting of 1879, by members of the Society, the Committee reported that there were three papers which specially attracted attention. They were as follow:—"On the Influence of the Rarefaction of Air, Barometric Pressure, and Temperature on the Illuminating Power of Gas," by M. Brémond; "On Burners of High Lighting Power, particularly Combination Burners," by M. Coze; and a "Note on Burners of High Lighting Power," by M. Ellisson. The Committee considered each of these papers worthy of a premium, and they therefore proposed that three prizes should be awarded instead of two, the value of each to be fixed at 250 frs. (£10), and that this amount should be handed over to the authors of the papers indicated.

The report then proceeded to specify the names and qualification of the foremen or workmen whom the Committee deemed worthy of the prizes of 200 frs. given by the Society for the longest and most satisfactory period of service in gas-works. With regard to the prize competition for 1880-81, the Committee proposed that, as last year, the sum of 5400 frs. should be devoted to prizes, as follows:—A sum of 4000 frs. to be divided among the authors of the best papers on any subject whatever specially connected with the gas industry; a prize of 1200 frs. to be divided among the authors of the best papers presented to the meeting of the year 1880; and the usual workmen's prize of 200 frs.; the Committee, as before, to determine the conditions of the competition.

The report was unanimously adopted.

The sealed envelope bearing the motto, "*L'Union fait la Force*," was then opened, and it was found to contain the names of M. Monnier, Civil Engineer, Paris, and M. Thibaudet, Engineer of the Marseilles Gas-Works; and to these gentlemen, therefore, the prize of 1000 frs. was awarded.

The meeting then proceeded to the election of five members to serve on the Committee to replace those retiring; also of a gentleman to act as Secretary of the Committee in lieu of M. Leclerc, who had announced his inability any longer to hold that office, on account of engagements. M. Cornuault, of Marseilles, having expressed his willingness to undertake the duties, his name was submitted to the meeting, and the sitting closed.

The following gentlemen are the office-bearers for the ensuing year:—*President*, M. Ellissen; *Vice-President*, M. Foucart; *Treasurer*, M. Vée; *Secretaries*, MM. Marché and Cornuault.

At the afternoon sitting the reading of the papers presented to the meeting commenced, and these and the discussions thereon occupied the members for the remainder of the first, the whole of the second, and a portion of the third day. The following is a list of the papers and communications:—

"Some New Appliances for Heating by Coke," by M. Amiel.
"Pressure Indicator, &c., and a New Method of Lighting Gas-Lamps from the Outside," by M. Brouardel.
"Application of the Hot System of Condensation, with the Object of Increasing Illuminating Power and Preventing Deposits of Naphthaline," by M. Cadel.
"A Heat Regulator, for Heating by Gas," by M. Chamon.
"Special Crushers for Small Coal and Coke, for Use in the Manufacture of Compressed Fuel," by M. Chapitel.
"Note on the Automatic Working of the Exhausters at Nancy," by M. Constantin.
"A New Kind of Tap," by M. Danquin.
"Apparatus for Effecting the Total or Partial Prevention of Gas Pressure in the Retorts," by M. Dessirier.
"Ovens of Nine and Eleven Retorts of Small Section," by M. Eichelbrenner.
"Improvements in the Falconetti Gas Meter," by M. Falconetti.
"On Servier's Condenser, and on Charpentier's Apparatus for Preventing the Heating of Coals when Stacked," by M. Foucart.
"On the Unit of Light employed in Photometric Trials," by M. Giroud.
"On Marini's High Power Burner," by M. Goelzer.
"India-rubber Joints for Gas Mains during the Winter of 1879-80. Construction of a Gasholder Tank-Well," by M. de Lachomette.
"On the Employment of Tar in the Production of Gas," by M. Lebreton.
"On Rights of Way. On a Level Indicator for Liquid Reservoirs and Gasholders. Pension Funds for the Benefit of the *Employés* on Gas Works," by M. Leclerc.
"On the Treatment of Ammoniacal Liquor," by M. Marché.
"On the Noise Produced by Gas Appliances," by M. Motet.
"Trials of Lighting for the Unloading of Ships and the Transhipment of Goods by Night," by M. Ponsin.
"A New Kind of Ascension-Pipe," by M. Renaux.
"On the Utilization of Breeze in Gas-Works," by M. Rouget.
"Table for the Calculation of Photometric Experiments according to the Plan of Dumas and Regnault. Verification of the Effectual Purification of Gas," by M. Salanson.
"Vertical Condensers. A lateral Knee-piece for Gasholders. Gasholders of all Kinds. Retort Charging Machine. Alarm Signal for Indicating Excess of Pressure and the Over-filling of Gasholders," by M. Servier.
"Methodical Washing of Gas by Means of Coke Scrubbers," by M. Vacher.

On the evening of the first day of the meeting the members of the Society, to the number of over 100, and their friends, among whom were the principal officers of the Paris Gas Company, had a banquet at the Hotel Continental. The President occupied the chair, and the toasts proposed by himself, M. Arson, and M. Vautier were cordially received. After dinner the company proceeded to inspect the large burners designed by M. Marini and M. Bengel, which had been fitted up in the courtyard of the hotel.

On the following evening the members assembled in the Avenue du Maine, at the laboratory of M. Jamin, who, at the special request of the President, had made arrangements for a thorough inspection by them of the electric lamp bearing his name. In a few well-chosen remarks M. Jamin welcomed his so-called enemies and competitors, and then proceeded to give them a succinct description of the mechanism of his lamp; after which M. Denayrouze, M. Jamin's assistant, stated what was his personal estimate of the net cost of the electric light compared with gas. During the visit, 40 of M. Jamin's lamps, supplied by means of several steam and gas engines, were set in operation for about an hour.

The morning of the last day of the meeting, Wednesday, the 23rd ult., was spent in disposing of the remaining business, the afternoon being devoted to visiting the new works of the Paris Gas Company at Clichy, on the banks of the Seine. Every possible effort had been made by the General Director of the Company (M. Camus) in order to render the visit—which he personally superintended, accompanied by the Sub-Director, M. Godot, and the staff—one that should be alike interesting and instructive to the members of the Society. The several Engineers of the Company conducted the visitors, divided into small parties, round the works, explaining as they did so every detail in connection with the working plant and general arrangement of what is destined to become the most important of the Company's stations, being, as it is, laid out for a yearly production of more than 60 million cubic mètres, or about 2118 million cubic feet of gas. After the inspection of the works the members assembled in the extensive purifying-house, where luncheon was served, and the cordiality with which toasts to the success of the Paris Gas Company and to the health of their eminent Director were honoured, testified the gratification of the visitors at the cordial reception they had met with.

With this visit the programme of proceedings was exhausted. Those of the members, however, who prolonged their stay in Paris went on the Thursday to the gas-works at Boulogne-sur-Seine, for the purpose of seeing in operation the retort-charging machinery of MM. Servier, Monnier, and Rouget.

THE RECENT GAS EXPLOSION IN THE METROPOLIS.

Adjourned Inquest.

The inquiry into the circumstances attending the deaths of Albert William Beavis and William Burr, who were killed on the evening of Monday, the 5th inst., under circumstances recorded in the last number of the Journal, was resumed on Tuesday last, at the Marylebone Court House, before Dr. Hardwicke.

Mr. Besley again appeared on behalf of The Gaslight and Coke Company; Mr. Webster, Q.C., for Messrs. Aird and Sons; and Mr. Sampson, Mr. Willis, and Mr. Gorton watched the proceedings on behalf of the owners of damaged property and the survivors of the deceased.

Mr. Vernon Harcourt, one of the Metropolitan Gas Referees, attended as the representative of the Board of Trade.

In opening the Court, the Coroner briefly referred to the fact of the advantage the jury would have on this occasion in the presence of Mr. Vernon Harcourt, who had been sent by the Board of Trade to assist him in conducting the inquiry, and, if necessary, to give evidence as to the explosion. There would, he said, be brought before them two persons who had witnessed the explosion in Bayley Street; and the District Surveyors of St. Pancras would be in attendance to answer any questions.

Mr. Besley reiterated the remarks made by him, on the opening of the inquiry on the previous Thursday, as to the desire of The Gaslight and Coke Company to afford every facility for a thorough investigation into the circumstances attending the explosion, especially with reference to the entrance of gas into the dead main, and he was sure they would have the assistance of Mr. Harcourt in eliciting from the witnesses some evidence as to how an explosive mixture found its way into that main.

Mr. Webster said, on behalf of Messrs. John Aird and Sons, he could fully endorse what Mr. Besley had said.

The following evidence was then taken:—

William Robert Sibley said: I am a gasfitter, and reside near Tottenham Court Road. On the evening of Monday, the 5th inst., at about three minutes to 7 o'clock, I was passing up Tottenham Court Road, when my attention was called to the pressure-gauge on the end of the main, in the trench at the corner of Bayley Street. Three men were in the trench examining round the cap on the main. I observed that the pressure-gauge was rather higher than what I thought was usual, and this attracted my attention. I thought there was a good pressure on, but did not make any remarks to anybody. The foreman came out of the trench, unfixed the pressure-gauge, and put his hand to the ½-inch stand-pipe. I do not know whether it was a light he applied, but I thought it was a cap. [Witness identified Hawkes as the man he referred to.] After this there was a loud clap caused by the cap that was on the main striking the other part of the pipe, and then I heard a rumbling noise like thunder going away in the distance—a sort of "thud," repeated five or six times. I should think there was an interval of a couple of seconds between each "thud." All the explosions occurred within two minutes. One of the men was picked up in the trench, and Hawkes went up the pipe and fetched out the other man. There was no smell of gas that I could perceive.

By the Jury: I am in the habit of using pressure-gauges.

By the Coroner: I have had occasions to try pressure-gauges in buildings, but I never think of having more than a 3½-inch pressure on, and this is not sufficient to blow the water out of the gauge. I cannot say whether the water was blown out of this gauge.

By Mr. Vernon Harcourt: I thought there was pressure in the main from seeing the gauge down on one side, and up on the other. I was about 6 or 7 feet away from the gauge, and could not see the scale of it clearly.

James Main said: I was looking at the men at work in the trench by the Bedford Head on Monday, the 5th inst. They were cutting the lead out of the joint of the cap on the main. The pressure-gauge having been taken off the stand-pipe, one of the men struck a match and applied it to the pipe, and directly he did so the explosion occurred. The man who was cutting the joint was driven up the pipe on the opposite side of the trench. I did not hear the other explosions. After the men were brought out of the trench I went to the corner of Percy Street, and saw that the road had been torn up.

By Mr. Harcourt: The explosion followed immediately upon the match being applied to the pipe. I saw no flame but that of the match.

Joseph M'Cartney said: I am a foreman in the service of The Gaslight and Coke Company, and was inspector over the men employed to lay down these pipes. We commenced the work on the 1st of March. I saw the mains laid from Howland Street, and the valve there was put in by me. It was tested before we received it, as well as upon the spot, and I left it safe and sound. I saw six lengths of pipe laid from it down Charlotte Street, and then I had to leave the work in consequence of the sudden death of my wife. We were working up from Tottenham Court Road to Howland Street. I do not know when the connection was made between Charlotte Street and Howland Street.

By Mr. Besley: I had nothing to do with the eastern section of the main, from the Bedford Head to Goswell Road. The empty pipes on the western section were put down about the 20th of March. [Model of valve produced.] The valve now produced is a model of the patent valve which was put in at Howland Street. In the ordinary course of business the valve is tested by the patentees; then by the Gas Company at Haggerstone, with water; and again when brought to the job. In order to make all sure we face it with Russian tallow. A cap was put on the valve. I did not notice any particular smell of gas after the valve had been put in, as there is generally a smell of gas when we are altering mains. When I went inside the main to cement the joints there was no smell of gas. On Monday, the 1st of March, I reported that the valve was in good working order, and that it seemed perfectly tight.

By the Coroner: We had been altering a 12 and an 8-inch main, and the escape of gas I smelt would probably proceed from these pipes; there is sure to be an escape when we have the end of a main open. At one time four Companies supplied this district, and the escape, if there was an escape, would be from one of the old mains. I cannot account for the gas getting into the new main.

Mr. Harcourt: Is there any other means you can suggest by which the gas could have entered the main, except through the valve?

Witness: There are a great many things which might be suggested. Supposing there was a fracture in the dead main, and a leakage was taking place from another pipe, the gas would enter the dead main. There could not have been much gas present; if there had been the explosion would not have occurred.

The Coroner: Do you think there was a fracture in the large main?

Witness: I was not there when the main was tested, so that I do not know.

Mr. Harcourt: Have you ever known of a case such as this, in which gas was found to have leaked into a main which had not been brought into use?

Witness: I have; it occurred some time ago in Camden Town, when we were making temporary connections.

By the Coroner: I use a light to test a pipe when I require it, but I cannot say what necessity there was for it here, as I was not present. I believe the gas is strong enough to burn.

William Hawkes, the contractors foreman, was recalled, and produced the pressure-gauge he had used on the main. He said: The gauge is always filled with pure water. From the marks on the glass it can be seen where the water stood from Saturday, the 3rd inst., to the following Monday; there was no pressure indicated—it was down at zero. If there had been any pressure we should have had to use a bag before taking the plug out of the main. Knowing it was connected with a live main, I took the precaution of trying it with a light. There was a little smell of gas, but no pressure. My opinion is that the gas must have got through the valve. I cannot say that any one had been trying it. If it were opened for a minute a large quantity of gas would pass through. People cannot get to the valve.

By the JURY: I do not believe that the keys of the water-mains fit our valves.

By Mr. BESLEY: The valve was taken off the pipe between six and seven o'clock in the evening. I applied the match directly I took the gauge off. I am quite sure the gauge stood at zero.

By Mr. WEBSTER: I am used to pressure-gauges.

By Mr. WILLIS: I have applied a light to a stand-pipe before, and when I have done so the gas, if there has been any, has flared, but has not exploded. I did not know that air when mixed with gas was explosive. I was not aware of the danger.

By the JURY: I did not smell any gas. The reason I applied a light was because I knew the main was connected with a live main, and therefore I thought I would take this precaution.

By the CORONER: I am now wise enough to know there was gas in the main, and I think that gas got through the valve. It is possible that it might have oozed out of the old mains, but I do not know how it could have got into the new main, because the castings are quite perfect.

Charles Hales said: I am foreman for Messrs. Aird and Sons. I had charge of the laying of these pipes, and it is part of my duty to see that they are perfect, and that the joints are properly made. The pipes are quite an inch thick. I do not see how gas could get into the new main from the old ones. We generally find a smell of gas when we open the ground, but there was not such a quantity in this case as to prevent our breathing properly. Sometimes we find the air charged with gas, but we do not think it necessary to use a safety-lamp. If there is plenty of gas we light it.

By Mr. HARCOURT: When laying this main we did not find a leakage sufficient to light.

By Mr. WEBSTER: After the pipes are laid we test them to see whether there is a leakage. This is done by forcing pure atmospheric air into the mains by means of a pair of bellows, and we then watch the pressure-gauge in order to see whether any air escapes. I never knew of a pipe being cracked by the pressure of gas. A crack in a pipe before it is laid can be detected by sounding them. None of the pipes in this case were imperfect; not a single one was rejected. I saw that they were all sound before they were put in. I made the connection with the valve, and having tried it I found it to be perfectly safe. After laying seven lengths of pipe from the valve down Charlotte Street, we went to Bayley Street and worked back.

By Mr. HARCOURT: After the valve was fixed it was tested with fire, to see whether any gas escaped. The pipes are caulked with yarn, and then from 2½ to 3 inches of lead run in. I look at every joint before it is filled in.

By Mr. BESLEY: The pipes are not supplied by Messrs. Aird; they are supplied by Messrs. Cochrane. There is no motive for putting in a bad pipe. If we found a bad pipe we should send it back.

Mr. *William B. Scott*, Chief Surveyor for the district of St. Pancras, said: I have been called upon by my Vestry to investigate and report on this accident, and I have visited the neighbourhood in order to see what damage was done to the property of the Vestry. While the main-laying work was going on, the only jurisdiction I had was with regard to the reinstating of the roadway. The contractors and the Gas Company are bound to give us notice in writing of a trench being filled in, and also of their intention to lay a main. I had notice that certain works were being done within the limits of the parish. The first operation is to sink trial holes to see what obstacles they will meet with in laying such a main as this, and after the main is laid the Company give us notice that the road is ready to be reinstated. I have no jurisdiction over the mains or the works, and have not in the present case interfered in any way. I have no power to compel the Company to lay the pipes at such a distance below the surface of the roadway as to render them safe from a steam roller. I have never been called upon to express an opinion whether a distance of 2 feet from the surface might prove dangerous, but no doubt it is an important point. A 36-inch main would only bear a certain pressure, and it might be damaged by a steam roller passing over it. A steam roller is used in some of the streets of our parish, and we have had instances of water-pipes being broken by it. I have not formed any opinion as to how the gas found its way into this main.

Mr. *Frederick Wallen*, District Surveyor for the Metropolitan Board of Works, said: About 13 houses in my district have been rendered dangerous by this explosion, and I have reported them to the Metropolitan Board, but I have not reported as to the explosion. I have no jurisdiction over the Gas Company, nor have I any control over the roads. I have authority only as to the structure of the houses, and not then until called upon to give an opinion. I have no authority as to actions occurring in the road which might be dangerous to the houses. The cellars of these houses have been injured by the explosion, and I have reported the fact, but I have no authority over causes which lead to these dangers, nor can I control the laying of mains which may have an injurious effect upon properties.

The CORONER remarked that he thought it would be as well to have evidence as to the preparation of the mains for the reception of the gas.

Mr. *Thomas Charles Hersey*, Chief Inspector of The Gaslight and Coke Company, said: The means adopted to expel the air from a main when we are about to fill it with gas are very simple. We allow the gas to flow into the main by opening a valve on an already charged main, and the entrance of the gas at one end gradually drives out the air at the other. We had a 2-inch pipe screwed into the 36-inch main, and when the connection was made we should have gradually opened the valve at Howland Street and forced the air out at Goswell Street. I should attend to this duty myself, and wait until I found pure gas coming from the pipe. The operation of expelling the air was to have taken place last Wednesday, and would have occupied about six or eight hours; but it would have depended entirely upon how far the valve was opened. In this case I should have done it gradually. When I found pure gas coming, I should have had the main closed.

A JUROR: How do you know when you have pure gas?

Witness: We have a small wrought-iron pipe, with a cock upon it, and when we smell gas at the pipe we apply a light.

Could you not supply the workmen with some mechanism to test with?—They have nothing to do with the testing; I do this myself. I am only responsible for what is done by the men under my directions.

By Mr. WILLIS: Hawkes had no right to apply the light; it was done without orders from me. I object to a light being used in the case of an escape.

By Mr. BESLEY: We had to remove old gas and water mains during the progress of the main-laying work; but the pipes so removed were properly replaced under my direction. Valves are tested by the patentee before delivery, afterwards at the Company's works, and again on the spot before being fixed. When the valve is placed in position, the spindle actuating it is about 2 inches below the surface of the roadway. On the 1st of March, after the valve was fixed, I told a man to go through the six lengths of main to try it with a light, and he reported that it was sound. The main was then capped, and from that date there was no indication, in any shape or form, of the valve being defective. When we subsequently went to make the connection with the portion of the main coming westward from Bayley Street, and took the cap off the six lengths of pipe, the air inside was found to be perfectly sweet. I had the cap placed on the six lengths of main laid from the valve when we stopped the work at that point. I laid a sufficient quantity of main down Charlotte Street to clear the roadway in Howland Street, and we then worked towards the valve from the other end. This was done because some years ago a man who had crawled up a long length of main was suffocated by some gas in it. There is no possibility, now that the accident has occurred, of our being able to give a positive opinion as to whether the valve had been tampered with, it having been blown to pieces by the explosion. I think there is a water-plug close by the valve.

By Mr. WEBSTER: It is our practice to test the mains for tightness, and this main had been tested, and reported sound, on the Friday previous to the accident.

By the JURY: I believe the key of the water-main will fit our valve.

Mr. HARCOURT: Can you inform me whether this main had been tested for tightness by air being pumped into it?

Witness: Yes; that was done by Messrs. Aird and Sons under my superintendence. The pressure was on from half-past eleven on the Thursday morning before the accident till the following Sunday, when it went off; that is to say, the air had leaked out of the main as it always does. If there is a fractured socket in the main the pressure will not rise; but in a large main like this if you can get the pressure up 2 feet in half an hour, as we did, it may be regarded as perfect. We do not expect to have it absolutely tight, because iron is porous.

Have you ever known of a dead main becoming charged with gas?—I do not know of a case.

You say you recollect a man being killed by gas finding its way into a main?—That occurred 20 years ago, when we were laying a main across Hyde Park, and the man, who was cementing the joints inside, was suffocated. In consequence of that accident I would not allow the men to work from the valve in Howland Street, but up to it. I do not think the gas that found its way into the new main escaped through the valve; my theory is that it escaped from one of the small mains, and entered through a slight fracture in the large main.

The CORONER: With relation to the diffusion of gases, are you aware that gases will diffuse themselves most rapidly through a small aperture?

Witness: I certainly was not aware of that.

Mr. HARCOURT: Is it your opinion that, but for the unfortunate application of a light, all would have gone on in the usual manner?

Witness: I believe so; I have no reason to suppose otherwise.

As to the practice of testing for gas, was it, in your opinion, exceptional that the contents of the main, should have been tested in this manner, contrary to the ordinary good practice of laying gas-mains?—I do not quite follow that; there was nothing out of the common in what we were doing, so far as our practice is concerned.

In applying a light?—I say there was no necessity to apply a light; I thought you were alluding to the testing of the main.

The CORONER: Previous to the air being made to escape in the manner you have described, you think it would not be a proper act to apply a light?

Witness: As I supposed there was only air in the main, I should not have expected to get anything by applying a light. The foreman found there was no pressure nor smell of gas, but knowing that the main was connected with a live main, he informs me that he applied a light as an additional precaution. Seeing that there was no gas in the main, I should not have applied a light.

Mr. HARCOURT: If there could not be any gas in the main, the test was useless, and if there was any the application of a light would be very dangerous?

Witness: Yes.

This length of main had been closed for nearly two months?—Yes.

During which time it lay in a soil in which gas may have been present, and having at one end a valve which may have leaked?—It may have lain in soil saturated with gas.

The CORONER: Gas was present in the soil?

Witness: Yes; so the foreman Hales stated.

Are you so satisfied with the joints of your mains that you think they are unable to be permeated with gas?—Quite satisfied.

Then how is it that the leakage of gas takes place to the extent it does?—Because the mains were not laid so well 20 years ago as they are now. I am perfectly satisfied with the method of joining; it does not admit of external leakage.

Mr. HARCOURT: In cases of this kind it is not necessary to test with a light?

Witness: Quite so.

Would it not be possible, by giving stringent instructions to workmen, to prevent the danger attending such testing?—This is a new thing to us.

By the JURY: If 10 per cent. of gas were in the main, it would amount to about 1400 feet. No more than the ordinary precautions are taken to protect the spindle attached to the valve; it is placed in an iron box, but there is nothing to prevent a person maliciously tampering with it. The key of the valve is kept in my office.

In answer to a question put by a Juror as to the power of a light to travel backwards,

Mr. HARCOURT said: Until this event, I should have thought it improbable that a light would have travelled down a ½-inch pipe into a gas-main.

The CORONER said the only remaining point was as to how the gas got into the main, and upon this he should like to have the opinion of an experienced person.

Mr. *William Foster* said: I am a Master of Arts, and am Professor of Chemistry and Physics at the Middlesex Hospital. For 2½ years I have been Gas Examiner to the Metropolitan Board of Works. I have visited the scene of the explosion, and have made some investigations on the subject. It is my opinion that the explosion was due to the presence in the main of an admixture of coal gas with atmospheric air.

The CORONER: What are the smallest proportions which you think would form a dangerous explosive mixture, and its maximum.

Witness: The maximum would require about 8 parts of air to 1 of gas; that is the maximum degree of explosive air. Then on each side less air, less explosive; more air, less explosive. One part to 9 parts is a 10 per cent. mixture, and this would be less explosive than 1 part to 8.

When would it begin to burn, and not explode?—I have not made accurate experiments on that point, but I made a mixture in my laboratory two or three days ago—I think it was a 20 per cent. mixture—which would not ignite backwards, using this 6-foot glass tube, ⅜-inch diameter; but if there was pressure behind it it would burn.

By the CORONER: I have here two samples of mixtures, one being 1 part to 7, the other 1 part to 9. The oxygen of the air is an element of danger; and combined with carbonic oxide, marsh gas, and other things, it is dangerous. The sudden combination is the cause of danger. I will apply a light to the tube I have here, and show you that the light will travel back; but with a similar mixture in a larger tube there will be an explosion. Coal gas is safe so long as it is not mixed with atmospheric air. [Mr. Foster then applied a light to a narrow tube, when the flame was seen to travel down; but on the application of the light to a larger tube the gas exploded.] I think in testing mains a proper jet should be constructed if a light is to be applied.

The CORONER: Can you form an opinion as to the means by which the gas in this case found its way into the main?

Witness: Only by an aperture in the pipe; it may have been through the valve, or through a fissure in the main itself.

Do you think that the side mains might have leaked to a sufficient extent to form an explosive compound?—Taking the diameter of the main as 3 feet, and its length as half a mile, its cubical capacity would be something like 16,800 cubic feet; and taking the mixture at 10 per cent., it would require about 2000 feet of coal gas to give a similar effect to that which you have just seen produced in one of the tubes. A short time ago I was requested to report on the explosion of a tar-tank at a country gas-works. A main had been recently laid alongside the tar-tank; there was a small man-hole, and coke had been piled on the tank. One day, while a man was emptying a barrow of coke, the whole thing blew up, and when I examined the circumstances, I came to the conclusion that there had been a leakage of gas from the main, and that it had diffused itself through the porous layers of brickwork. It is a fact that gases do diffuse at a certain rate, and through very small crevices—in fact, through what we should call a solid material. They find their way through brickwork and porous substances. The tar-tank explosion was a most typical case.

Mr. HARCOURT: You would not include cast-iron and the joints of mains among porous substances?

Witness: No; these would only be permeable in certain cases. The joints in this main were filled in with molten lead.

By the CORONER: I have not examined the joints personally, or tried any experiments upon them.

Mr. WEBSTER said the new main was simply intended as a conduit main; there was not to be a single service upon it.

Mr. BESLEY: This being a conduit main, and 1 inch thick, is it your theory that gas might have diffused itself through the pipe?

Witness: No; that is not my theory; I do not think it is possible. The circumstances of this case are not such as to give any support to the theory. The adjacent gas-pipes had been opened from time to time.

The CORONER: While laying down this main, was the atmosphere sufficiently charged with gas to be dangerous?

Witness: I think not.

What quantity of gas becomes unbreathable in atmospheric air?—One per cent. would make the atmospheric air very offensive indeed. Carbonic oxide is an objectionable constituent of coal gas.

A JUROR: The foreman said he could not smell gas coming out of the pipe?

Witness: I heard from one of the people that there was a slight trace of gas.

Will not 10 per cent. of gas make the air very offensive?—Very offensive indeed.

Mr. HARCOURT: I wish to correct a statement I made just now. It certainly was my impression that one would not beforehand have thought that applying a light to a small pipe would be as dangerous as it has proved to be; this depends, however, on the probability of there being air and gas in the main within those limits which would render it not only explosive, but would cause a small pipe charged with the mixture to act as a conductor of the flame downwards into the main. I have made experiments upon these points, and I find that within the limits of 4 of air to 1 of gas, and 10 of air to 1 of gas, the mixture is sufficiently explosive to travel down a tube of the diameter of the stand-pipe here.

The CORONER, in addressing the jury, said they had first to inquire into the cause of the death of these two men, and this might be said to have been from injuries received by the explosion. If the jury thought the explosion came under the head of what might be termed an accident, they might, if they thought proper, append to the verdict an expression of opinion as to what should be done to prevent similar accidents in the future. Evidence had been given that undoubtedly there was an explosive mixture in the main, that 10 per cent. of coal gas mixed with air was a dangerous explosive compound, that a light would travel back in a tube of small diameter, and that the men employed in the main-laying work were not aware of the extreme danger they ran in applying a light. It became a question whether the men should not have had some knowledge, and have adopted measures for the safety of the public. He did not know that any blame could be attached to the officials of either the Gas Company or the contractors, who had been anxious to afford every information, and would, no doubt, do what they could to prevent a similar accident occurring again.

The jury then retired, and after an absence of half an hour, returned into court with the following verdict:—"We are of opinion that Albert William Beavis and William Burr met their deaths by an explosion of gas, such explosion being caused by a light being ignorantly placed to a stand-pipe by the foreman Hawkes, gas having been introduced into the new main by some defect in the valve in Howland Street. We are further of opinion that additional care should be taken by The Gaslight and Coke Company in the testing of new mains."

The CORONER: You say "by some defect in the valve in Howland Street." Does the evidence go as far as that? The valve might have been opened by misadventure, and if so the verdict does not cover it.

The FOREMAN: We cannot come to any other conclusion.

Mr. BESLEY said he did not wish the jury to alter their verdict, but he thought they hardly expressed what they meant. As the verdict stood, it implied that there was some defect in the manufacture of the valve, or that it was put in defectively; but as he understood, the jury meant by a defect of the valve as a valve on the day of the accident.

A JUROR said they did not mean to imply that an improper valve had been put in, but that the gas had escaped somehow through the valve.

Mr. HARCOURT said the word "defective" was a little ambiguous. A large valve of this kind would not be considered in any sense defective if there was a small leakage; that would be perfectly immaterial, having regard to the purpose for which the valve was intended; but yet such a leakage, going on for two months, into a main perfectly closed, would produce an explosive mixture.

A JUROR said they simply meant to say there had been leakage through the valve.

The inquiry then closed.

EXPLOSION OF GAS AT BILSTON.

The sensational accounts of the explosion of gas in Tottenham Court Road, published in the London daily papers, and reproduced, in part, in the provincial press, caused very exaggerated reports to be circulated as to two explosions which occurred last Tuesday in Church Street, Bilston, during some main-laying operations.

The facts of the case are shortly these: The Bilston Gas Company's workmen have been recently engaged in Church Street laying a new main, and making the service connections as the work on the main progressed. On Tuesday last the upper part of the street had been finished, and the men were employed near the Market Place. Although the pipes had been laid and covered up, there was a strong smell of gas in front of one of the shops; and, complaints having been made, one of the workmen, from instructions, commenced about ten o'clock to search for the escape, and decended into the cellar under the shop to examine the pipes, but failed to discover the place of escape. He then proceeded to examine a pipe in a small hole opposite the shop door, and upon the application of a light, an explosion occurred, followed by the upheaving of about 60 yards of road, and the fracturing of some water-pipes. This explosion was, however, not in the mains, but in an unused surface-drain, which had received the gas escaped from a decayed pipe in front of the shop. Mr. J. S. Reeves (the Secretary and Manager of the Company) at once directed a number of workmen to excavate to the broken water-pipes, and in doing so, a spark, caused by the pick of one of the men, produced a second explosion; but as the men were near the opening of the drain the effects were slight, and no injury was done to any one, except Mr. Reeves, who received a few scratches on the face. The second explosion was, no doubt, caused by the gas escaping from the old pipes displaced by the first explosion. Prompt steps were taken to ventilate the old drain and repair the broken pipes. The progress of laying the main was for a short time suspended, but there was a plentiful supply of gas throughout the town as usual. No injury whatever was done to house property; while the fright from the noise of the explosion was aggravated by a very violent thunderstorm which followed shortly afterwards.

METROPOLIS WATER SUPPLY.

The Registrar-General publishes the following table in reference to the water supply of London during June. According to the returns furnished to him by the Metropolitan Water Companies, 146,918,736 gallons, or 667,519 cubic mètres of water (equal to about as many *tuns* by measure, *tons* by weight), were supplied daily; or 251 gallons (114·0 decalitres), rather more than a *ton* by weight, to each house, and 35·4 gallons (16·1 decalitres) to each person, against 33·7 gallons during June, 1879.

COMPANIES.	Number of Houses, &c., supplied in June, 1879.	Number of Houses, &c., supplied in June, 1880.	Aver. Daily Supply of Water in Gallons* during June, 1879.	Aver. Daily Supply of Water in Gallons* during June, 1880.
Total supply	563,097	584,981	134,725,109	146,918,736
From Thames	269,370	281,660	70,080,369	74,499,905
„ Lea and other Sources	293,727	303,321	64,644,740	72,418,830
THAMES.				
Chelsea	29,700	30,071	8,855,800	9,474,300
West Middlesex	52,332	54,647	11,033,588	11,726,694
Southwark and Vauxhall	86,309	90,339	24,029,174	23,539,542
Grand Junction	39,618	42,171	12,493,807	13,339,970
Lambeth	61,381	64,432	13,668,000	16,419,400
LEA AND OTHER SOURCES.				
New River	128,213	130,604	27,394,000	30,877,000
East London	118,910	122,746	29,041,000	32,643,000
Kent	46,604	49,971	8,209,740	8,898,830

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for June, 1880, as compared with that for the corresponding month of 1879, shows an increase of 21,884 houses, and of 12,193,627 gallons of water supplied daily.

PAISLEY CORPORATION GAS SUPPLY.

The Annual Meeting of the Paisley Gas Trust was held last Thursday—Bailie CLARK presiding—when it was reported that, at the last meeting of the Finance Committee, the abstract statement of the revenue and expenditure for the past year was read. This stated that the amount at the credit of the surplus account on the 28th of May, 1879, was £16,256 11s. 5d., of which £3471 12s. 9d. had been voted for public improvements. The amount of surplus for the past year, irrespective of £1000—instead of £500 as the previous year—for the sinking-fund, and £600 for building a new gasholder, was £1530 6s. 7d. The Committee agreed to recommend that the price of gas be the same as last year—viz., 3s. 9d. per 1000 feet. The abstract statement of income and expenditure having been taken as read,

Treasurer RUSSELL moved its adoption.

The CHAIRMAN said, seeing that they had a considerable amount of debt on their shoulders, and that they had already voted so much surplus to the extinguishing of the debt or the extension of the works, he would move that the sum of £1530 6s. 7d. be added to the surplus accounts, which would make the sum voted to that fund £14,315 5s. 9d. He did so, believing it was in accordance with their Act of Parliament. He held that they were bound to keep the works in a state of efficiency, and, before anything whatever outside, allow for the improvements of the gas-works. In the Corporation's Act of 1870, he found in clause 85 that all moneys from time to time received by the Corporation—not being money borrowed, or money the application of which was therein specially provided for, but money obtained from profits on gas supply, must be used—(1) to pay the expenses of obtaining the Act; (2) to the payment of expenses in the management of the gas-works or corporation; (3) as payment of the gas annuities, and interest on money borrowed under the Act; (4) in setting aside not less than £500 in any one year for a sinking-fund, to be applied for the redemption of annuities or mortgages; (5) in carrying the powers and provisions of the Act into execution, "including any extension and improvement of the gas-works and mains;" and (6) towards the cost of improving existing streets, opening up new streets, and erecting new buildings, &c. Not until the first five stipulations were fulfilled could the sixth be looked at, and from the state of their accounts it was perfectly clear to him that to carry out the letter of the Act they were called upon thoroughly to maintain the works in a state of efficiency, and to make the improvements and extensions that were required out of the profits they might obtain from year to year. He held that it was unfair to large consumers to use the money otherwise. They made profits on the large consumers. One firm paid £1500 a year for gas. Of the sum of £5471 12s. 5d. voted over for public improvements, he (the Chairman) was sure he only paid about 10s.; while one manufacturer in town paid no less than £150 towards them. This, he held, was an indirect way of taxing the people, and it was not a fair way.

Mr. COCHRAN also expressed himself as opposed to the indirect taxation

of the inhabitants. He thought it was too much to give the whole of the balance for public improvements.

Bailie M'Gown said it was quite clear that if they adopted the Chairman's line of argument, they would never have any more public improvements at Paisley. The framers of the Corporation Act of 1870 and Provost Murray, who was an able and sagacious man, would surely not have put in a clause such as the last one, which had been quoted, unless they had some expectation of a little more money for public improvements. It was unreasonable to speak of giving the £1500 to pay off a portion of the late extension of the works that had all been added to capital. In the year 1869, for instance, there was a surplus from the Gas Trust of £1576, which was positively more than they now spoke about. That was carried forward as proposed to be done with the past year's surplus. The income last year was £25,000, as against £15,000 in 1869, and in 1871 the income was £18,000, and the surplus was added to the same fund. It was said that large consumers of gas were paying for the public improvements. Hd submitted that this was not the case. He held that generations past hat paid very high prices for gas, and it was out of the prices thus paid that the works were in such a splendid condition. They were now able to sell gas at 3s. 9d. per 1000 feet, and he submitted that 3s. 9d. was about the lowest price in any community in Scotland. He found in Edinburgh that it was 4s. 2d.; in Glasgow, 3s. 10d.; Aberdeen and Greenock, 4s. 2d. each; Stirling, 4s. 2d.; and Kilmarnock, 4s. 7d. The only town where it was 1d. less than they were was Dundee, but that gas was only equal to 24 or 25 candles, which was not to be compared to theirs.

Treasurer Russell: There is one at 3s. 6½d.

Bailie M'Gown: Galashiels; but the consumers pay for the service-pipes from the Company's mains. He had no sympathy whatever with the outcry that the gas-works were in danger on account of discoveries. He held that the gas undertaking was the best property connected with the Corporation. Assuming the price paid for gas-works on a recent occasion with which he was acquainted, their own works would be worth about £130,000, while it was admitted that the debt was under £60,000. If they annually took out £1000 to redeem the debt, and gave cheap gas at the same time, it seemed to him in accordance with the Corporation's Act of Parliament that they might apply some of the profits for public purposes. The clause read by Bailie Clark no doubt said that extensions and improvements were to be paid for first; but he held that there was spirit in an Act as well as letter, and the spirit of the Act was clearly that if the works were kept up in a fine condition, and if the gas was cheap, they could use the surpluses to some extent for public purposes. In these circumstances he moved that they should carry the £1530 6s. 7d. forward.

Treasurer Russell said the Chairman had mixed up the price of gas as well as the surplus £1500. He had not told them the large sums of money that the consumers of gas had paid which had gone for the extension of the works and the redemption of stock. Under the joint management, from 1845 to 1870, £48,000 was paid by consumers of gas, which went to increase the works and to redeem capital. Since 1870, when the Corporation obtained the management of the works, they had paid over £17,785, which made in all £47,785 for extensions, and redemptions of stock and payment of interest; and he thought the public ought to get the advantage of that money. Keeping the gas at 3s. 9d. per 1000 feet, they would have a surplus of £4500 next year, and what were they going to do with it? He had no objection to the £1500 standing over as Bailie M'Gown moved, but he wished 2½d. taken off the price of gas, thus making it 3s. 6½d. Supposing they did this, they would still have £1800 surplus at the end of the year, which would make £3300; if they did not hand over £1500 towards paying off the debt, they would have still £1800 of a surplus, and he had no objection that the £1500 be added to it.

Bailie Speirs supported Treasurer Russell, as he did not see why they should not give the community cheaper gas.

Mr. Johnston thought the first thing was to say what was to be the price of gas in the future, and then what they should do with the present surplus of £1530. He considered the whole amount of the surplus should go back as part payment of the older portion of the works destroyed previously to the erection of the new ones. He should be sorry indeed if the whole surplus went the way indicated. He thought they should not do everything for posterity. He certainly supported the resolution moved by Bailie M'Gown, that the £1530 should not be voted for the reduction of the debt incurred in connection with the past extensions of the works, but should be set aside. He intended afterwards to give notice of motion that £150 of the surplus be allocated to extinguish the debt on the Brodie Park.

In reply to a question,

The Chairman said his motion was that the £1530 be applied for paying off the debts incurred in extension and maintaining the works as required by clause 5 of section 85 of the Corporation's Act of 1870, while Bailie M'Gown's amendment was that the surplus be not dealt with in the meantime.

A motion to delay the further consideration of the matter was then agreed to, Treasurer Russell saying he would, on the debate being resumed, take the opportunity of moving that the price of gas be reduced.

It is stated that at the forthcoming meeting of the Sanitary Institute of Great Britain, to be held in Exeter in September next, a large number of gas cooking and heating stoves will be among the exhibits in the group of lighting and ventilating appliances. In connection with this matter we learn that the Exeter Gas Company have decided on offering medals and prizes for the best description of cooking-stoves heated by gas.

Kilmarnock Corporation Gas Supply.—At the usual monthly meeting of the Kilmarnock Town Council on Wednesday, the 7th inst., the annual report of the Gas Committee was presented. It showed that there was a profit on the year's transactions of £794 11s. 9½d. to be added to profit and loss account, from which sum there fell to be deducted £636 15s. as sinking-fund, being 1½ per cent. on £42,450 of mortgage debt and bonds, in accordance with the Municipal Extension Act of 1871. The gas sold amounted to 37,080,150 cubic feet, being 1,769,850 cubic feet less than last year. The value of gas sold for the year ending 1879 was £8701 17s. 3½d.; for the year just closed, £8497 13s. 8½d., being £404 3s. 7½d. less. Meter-rents also showed a decrease of £14 10s. 8d., there being 118 consumers fewer than in the preceding year. The income for coke showed £58 18s. less than in 1879, arising partly from a smaller consumption of coals, and partly from the lower price received for the coke itself. The income from the chemical works was £1098 15s. 2d., being £178 14s. 0½d. less than last year. This was accounted for from the fact of 472 tons of coals less consumed last year, and also by a fall in values of tar, naphtha, and ammonia. The revenue from these was equal to 5s. 0½d. per ton of coal carbonized, as against 5s. 3½d. last year. The loss of income from gas sold, meter-rents, chemical works, &c., was more than met by the reduced expenditure in coals used, dross, wages, lime, meters, and other accounts. Instead of carrying the cost of the extensions effected last year to the gas-works account as formerly, the whole cost of them, amounting to £675 12s. 3d., was paid out of revenue. The outlay during the year for extensions of works and street-mains amounted to £675 12s. 3d.

OLDHAM CORPORATION GAS SUPPLY.

From the last annual report of Mr. Herbert Andrew, the Superintendent of the Oldham Corporation Gas Department, it appears that during the twelve months ending March 25, the expenditure on capital account was as follows:—

Higginshaw gas station	£4793	14	7
Hollinwood ,,	177	9	10
Gas-mains	1370	15	11
	£6342	0	4

The amount of gross profits was £25,808 19s. 10d., and after paying therefrom the annuities, the interest on mortgages, and £2248 to the sinking-funds, there remained a net profit of £14,324 12s. 7d. From this surplus it has been resolved to pay the sum of £13,500 to the borough-fund, leaving a balance of £824 12s. 7d. for disposal.

The price charged for gas was 4s. 2d. per 1000 feet, with discounts, as in previous years, varying with the consumption "within the municipal borough," "beyond the municipal borough, but within the limits of supply," and "beyond the limits of supply" respectively.

The quantity of gas manufactured was as follows:—

Oldham gas station	125,881,000 cubic feet.
Higginshaw ,,	169,617,000 ,,
Hollinwood ,,	159,490,000 ,,
Royton ,,	29,114,000 ,,
Total	484,102,000 cubic feet.

Against 464,033,000 cubic feet in the preceding year; and the quantity of cannel and coal carbonized in its manufacture was 48,549 tons 12¾ cwt., being an increase during the year of 2427 tons 2¾ cwt. The average quantity of gas made per ton of cannel and coal carbonized was 9971 cubic feet. The quantity of gas delivered was 483,501,000 cubic feet, against 464,068,000 cubic feet in the previous year, or an increase of 4·187 per cent. The loss from leakage and condensation was 27,179,000 cubic feet, or 5·621 per cent. of the quantity delivered. The maximum quantity delivered in 24 hours was 3,235,000 cubic feet on Dec. 31, and the greatest production was 2,875,000 cubic feet. The average illuminating power of the gas was equal to 18·35 candles, the standard in the Corporation Act being 14 candles.

During the past year 1751 new meters were fixed and 1348 consumers added. The total number of meters now in use is 31,640, and the number of consumers is 30,924. The length of gas-mains laid in extensions, enlargements, and renewals was 10,850 yards, and mains taken up 1704 yards. The number of public lamps within the district of supply is now 2788, being an increase for the year of 86. There are now 2014 public lamps within the corporate borough, and 774 in the out-townships.

The total amount of capital borrowed on the 25th of March was £230,570, with unexhausted power to the extent of £3880; while £44,050 has been redeemed from the sinking-funds since the Corporation Act of 1853 was passed.

The capital account shows that the sum of £100,000 is debited as the cost of the transfer of the old Company's undertaking on the 31st of July, 1853—viz., the value of the works and mains, as per the Company's books at the time of the purchase, £69,155 10s. 8d.; and amount paid for goodwill to the Company, on estimating the annuities at 25 years purchase, £40,844 9s. 4d. Then there has been expended by the Corporation (exclusive of the £6342 0s. 4d. mentioned above) £225,442 18s. 11d. on extensions.

The revenue account was as follows:—

Dr.—*Revenue Account for the Year ending March 25, 1880.*

Manufacture of gas—						
Cannel and coal, including carriage, unloading, &c.	£35,987	17	2			
Purifying materials and wages	2,025	19	2			
Oil, water, and sundries	535	2	8			
Rent of telegraph	57	0	0			
Salaries of Manager and Officers at works	1,065	2	6			
Wages (carbonizing)	6,586	9	3			
Repairs and maintenance of works and plant, &c.	7,208	1	7			
				£53,465	12	4
Distribution of gas—						
Salaries and wages of Officers and Rental Clerks	£1,323	13	7			
Repairs, maintenance, and renewal of mains and of service-pipes (less old materials sold, £302 10s. 5d.)	1,542	12	10			
Inspectors uniform	70	0	6			
Services, meters, &c.	2,241	17	8			
				5,178	9	7
Rents, rates, and taxes				2,468	4	5
Management—						
Salaries of Superintendent and Clerks	£289	4	8			
Do. Collectors	304	2	0			
Proportion of Town Clerk's and Treasurer's salaries	250	0	0			
Stationery, printing, advertising, and stamps	237	17	9			
General establishment charges and incidentals	170	3	4			
				1,251	7	9
Law expenses, deed stamps, &c.				7	18	8
Bad debts				2,021	15	0
Balance carried to profit and loss account				25,808	19	10
				£90,202	7	7

Cr.—*Revenue Account.*

Sale of gas—						
Gas per meter to private consumers	£86,506	11	0			
Gas for public lamps	5,653	18	11			
	£92,160	9	11			
Less discount	18,501	8	8			
				£73,659	1	3
Residual products—						
Coke (less labour, £227 17s. 4d.)	£4,650	9	11			
Lime and ferric oxide	144	17	8			
Tar	3,405	9	4			
Ammoniacal liquor	5,104	6	9			
				13,305	3	8
Rental of mains				51	5	11
Rents of cottages, &c.				308	16	11
Services, meters, &c.				2,877	19	10
				£90,202	7	7

In the appendices to the accounts, interesting information is given as to the number of the consumers added, and the sizes of meters fixed, in the different months of the past year; as to the mains laid and taken up during the same period; as to the gas manufactured and consumed from July 31, 1853, to March 25, 1880; and as to the gross profit made, and the mode of its appropriation, from 1875 to the present year.

A Corporation Official convicted of Embezzlement.—At the Manchester Summer Assizes last week, Frederic Hepton, aged 40, late chief clerk and cashier in the Water-Works Department of the Manchester Corporation, was charged with having embezzled, on the 24th of March last and other days, various sums of money amounting in all to nearly £3000, the property of his employers. After a protracted trial, the prisoner was found guilty, and sentenced to ten years penal servitude.

GLASGOW CORPORATION GAS AND WATER SUPPLY.

Mr. W. West Watson, F.S.S., the City Chamberlain of Glasgow, in his report upon "The Vital, Social, and Economic Statistics of Glasgow for 1879," speaking of the Gas Committee and the Water Commission, says: Each of these Trusts has, during the past year, pursued the equal tenor of its way, and its history has presented no novel or interesting feature to record, although a few dry statistical facts regarding the progress of each are given below:—

Gas Committee.

The supply of gas continues to be most satisfactory, and it greatly exceeds the limit of illuminating power prescribed by the statute, yet the price has been reduced to 3s. 10d. per 1000 cubic feet. 21,000 yards, or something over 12 miles of new mains have been laid during the year, and the number of meters in use in the middle of the year was 132,054. These are the property of the Committee, and they are furnished without charge to the consumers.

Some time since, the Corporation authorized a connection by a 24-inch main-pipe between the Partick district and the great Dawsholm works. That is now completed, and the Partick Gas-Works being thereby rendered unnecessary, the ground which they occupy, and the whole machinery and plant, are now to be disposed of by the Committee.

The producing power of the gas-works is 1,300,000 cubic feet per day, and one very dark day in the winter of 1878-79 actually taxed their powers to the extent of 11,985,000, but that was a rare and most exceptional occurrence.

The following table exhibits the quantity of gas manufactured during each of the last 14 years; of course, however, the whole of this did not pass into consumption, as there is an unavoidable loss from leakage and other contingencies, even atmospheric, which no ingenuity has yet succeeded in overcoming:—

Quantity of Gas Manufactured in Glasgow during the Years from 1832 to 1879.

Year.	Quantity of Gas made, in Cubic Feet.	Year.	Quantity of Gas made, in Cubic Feet.
1832 . . .	100,068,200	1867 . . .	1,119,842,000
1837 . . .	162,605,800	1872 . . .	1,559,190,000
1842 . . .	198,522,500	1875 . . .	1,649,616,000
1847 . . .	391,353,000	1876 . . .	1,738,376,000
1852 . . .	505,285,000	1877 . . .	1,817,163,000
1857 . . .	697,378,000	1878 . . .	1,777,846,000
1862 . . .	821,849,000	1879 . . .	1,833,678,000

The following reports, dated in the middle and at the end of 1879, exhibit the illuminating power of the gas as supplied at these dates:—

	Illuminating Power, Average.	No. of Days below 25 Candles.	Average Temperature of the Gas.	Average Barometric Pressure.
Northern and Western Districts	June 29·73	June 0	June 61°	June 29·41
Ditto	Dec. 26·93	Dec. 0	Dec. 57°	Dec. 29·98
Central and Eastern Districts	June 27·18	June 0	June 62°	June 29·45
Ditto	Dec. 26·00	Dec. 0	Dec. 56°	Dec. 30·03
Southern Districts . .	June 27·92	June 0	June 62°	June 29·50
Ditto	Dec. 25·33	Dec. 0	Dec. 49°	Dec. 30·08

Water Commission.

The total revenue for last year amounted to . . .	£140,578	11	6
The total revenue for preceding year amounted to.	138,292	8	10
Showing an increase, in comparison with the preceding year, of	£2,286	2	8
The total expenditure for last year, exclusive of the sum carried to the sinking-fund, was.	£125,728	11	0
The total expenditure for preceding year	115,450	3	9
Showing an increase, in comparison with the preceding year, of	£10,278	7	3
But the actual gain upon last year's account was .	£14,850	0	6
And there was carried to the sinking-fund account	15,096	2	2
Leaving against the revenue of the year	£246	1	8

The rates levied were unchanged, viz.:—Domestic rate within the City and Royal Burgh of Glasgow, being the limits of compulsory supply, 8d. in the £1; the public water-rate within the same limits, 1d. in the £1. The domestic water-rate beyond the limits of compulsory supply has remained, as before, at 11d. in the £1. The rates for other than domestic purposes are charged according to a published table.

The quality of this water remains unassailable, and it is needless, year after year, to offer an analysis of what is on all hands admitted to be one of the purest waters in the kingdom, if not, indeed, the very purest. Suffice it to say, that upon Dec. 15, not the most favourable season of the year, there were found in 100,000 parts, only 3 parts of solid matter, and the amount of hardness—*i.e.*, soap-destroying ingredients—amounted to 1·1 in the 100,000, while almost all the waters used in London contain above 20 parts of hardness and 30 to 33 parts of solid matters.

The supply continues undiminished, and is greater than sufficient to meet all demands. During the past year the quantity sent into the city and district averaged 37,636,265 gallons a day, and of these there came—

	Gallons.
From the Loch Katrine works.	34,226,906
From the Gorbals works	3,413,350
	37,636,265

showing an *increase* of no fewer than 3,623,508 gallons daily over the quantity supplied in the immediately preceding year. An idea of the magnitude of the demand and supply may be gathered from the fact, that during the past year no fewer than 12 miles of new pipes have been laid down, with the view of improving and increasing the supply to the city and district.

Derby Water-Works Company.—What was expected to be the final meeting of this Company was held on Thursday, the 1st inst.—Mr. G. Gascoyne in the chair—when an interim dividend of 6½ per cent. on the shares of the Company for the half year ending Dec. 31, 1879, was declared. As it had been found impossible to get in all accounts due to the Company, and discharge the debts owing by them, it was resolved to adjourn the meeting till Oct. 1, "for the purpose of receiving a final statement of the Company's accounts, and deciding as to the disposal of any cash remaining in hand after all the Company's liabilities have been discharged, and to transact any other business connected with the winding up of the Company." The Directors were given their fees, as previously, for their labours in regard to the dissolution of the Company; and a vote of thanks to them for their services was passed.

THE LANCASHIRE COAL AND IRON TRADES.

(from our own correspondent.)

Extreme depression prevails throughout the coal trade of this district, and colliery proprietors, to move away their surplus supplies, are compelled to quote very low figures to secure orders. So little confidence is there in any early revival in trade, that in some cases pits are being closed altogether for the present, and the willingness displayed to contract for long forward deliveries at low prices is a further indication that there is little probability of the demand overtaking the means of production for some time to come. This feeling in the market is particularly noticeable so far as gas coal contracts are concerned, and offers for long forward delivery are so freely made that buyers in most cases are able to confine their selections for contracts to tenders extending over three years. This, indeed, is the only basis upon which many of the gas coal consumers will entertain tenders, whilst, so far as prices are concerned, there are offers at lower figures than have been known for years past, screened gas coal being offered for delivery equal to Manchester at as low as 7s. per ton, and cannel from the Midland Counties at as low as 9s. per ton. These, of course, are exceptional prices, but there is no difficulty in obtaining good screened Lancashire gas coal delivered into the Manchester district at from 7s. 6d. to 8s. per ton. For other descriptions of round coal there is very little doing. In house fire qualities the demand is extremely small, and common classes for steam and iron-making purposes are only in limited request. The better qualities of round coal for house fire purposes can be bought in quantities at the pit mouth at from 7s. to 7s. 6d. per ton; seconds at from 5s. 6d. to 6s.; and common coal at from 4s. 6d. to 5s. per ton. For engine classes of fuel there is a fair demand, but supplies, as a rule, are plentiful. For burgy, which only meets with a dull sale, 3s. 9d. to 4s. 3d. is quoted, but good slack is generally firm at from 3s. 3d. to 3s. 9d. per ton.

The shipping trade is very dull, and steam coal delivered either at Garston or Liverpool is pressed for sale at about 6s. per ton.

In the iron trade there is no large amount of business doing, but prices are firm, with an upward tendency, so far as pig iron is concerned. Lancashire makers, whose prices recently have been under those asked for Cleveland iron in this district, have, as a consequence, been able to book orders which would otherwise have gone to the North, and they are now asking higher figures; No. 3 foundry, delivered equal to Manchester, being this week quoted at 50s., less 2½, and forge at about 49s. per ton. Finished is without material change, bars being still offered for delivery into the Manchester district at under £6 per ton; but more inquiries are reported, and there is, if anything, less disposition to quote under list rates.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(from our own correspondent.)

The coal trade, following the line of improvement manifested in the sister industry, is now beginning to look somewhat more active than has been the case during the past few months. As in last week's report was stated to be probable, the upward tendency of the iron market has in a great measure affected the autumn prospects of local colliery proprietors, and they are now asked for quotations in bulk for forward delivery of all kinds of iron-making fuel. The animated state that prevailed at the recent quarterly meetings, and also at last week's iron markets, has already led to the placing of several good contracts for terms extending as far on as the end of the year. At Wolverhampton on Wednesday, and at Birmingham on Thursday, several lots were booked at recent rates. The consequence, however, was a general stiffening of prices, and one buyer who sought to place an order for 16,000 tons of furnace coal was unsuccessful. Coal for both furnace and forge consumption, as also slack and rakings, are now in fair request, and cannot be purchased at the rates existing a month ago. Furnace coal, though to be had in small lots at some of the local pits, at prices as low as 8s. per ton, cannot be obtained in quantity from the best collieries under 9s. and 9s. 6d. Gas coal keeps in steady request, and house coal is more inquired after since the improvement in value of manufacturing qualities. In Cannock Chase deep coal a brisk trade is being done, and most of the pits are making a good output. Prices now ruling for this latter quality are 12s. to 13s. per ton.

Manufacturers of iron of both raw and finished qualities are now experiencing a decided alteration for the better. The foreshadowing of improvement apparent at the quarterly meetings of the ironmasters has continued to develop since, and both mills and forges are in a considerably more active state, while the progressive decline of pig-making furnaces, which steadily set in at the close of the first quarter of the year, has not only been arrested, but a reaction has set in, and during the last week operations of blowing in were commenced in two or three parts of the district. Rates are gradually rising again, and though the standard quotation of £8 for marked bars is still unaltered, it is considered that a few days time will see a change in this direction. Unmarked iron is rising, and several qualities have gone up 5s. and 7s. 6d. per ton within the last 14 days. In many cases makers refuse to book orders of considerable quantities, except at a further advance. Pig iron is in fairly active request, more especially local productions. Stocks have been cleared out, and parcels of Derby, Northamptonshire, and other brands are purchased in the district, also at rising rates. Indeed, all kinds of foreign pigs are steadier. Middlesbrough g.m.b. being 42s. and 43s. for No. 4 forge, f.o.t. West Coast hematites are at present offered at 75s.; hot-air pigs realize £3 15s.; and part-mine, £3 to £3 7s. 6d. Common cinder quotations are £2 5s. Most of the sales of unmarked iron were effected last week at £6 15s. and £7. Puddlers bars have risen 2s. 6d., and sheets have gone up all round 5s., 7s. 6d., and 10s. over the prices of a week ago. Galvanized qualities have been advanced as much as 20s. in the week, and buyers are still anxious to transact business. Boiler plates, girders, angles, and tees are well looked after, but rates have varied but little. In most of these kinds of finished iron, business has been brisk, and the transactions of a respectable character.

THE YORKSHIRE COAL AND IRON TRADES.

(from our own correspondent.)

The state of the iron trade is quiet, nearly all departments being not over well off for orders. Some of the large firms where specialities are produced, including gas and water pipes and gas apparatus, are faring better than those places where ordinary castings and colliery work are chiefly manufactured. There is very little change to note with respect to the make of pig iron, and although business is much weaker than it was a short time ago, the output is kept up. With few exceptions, the works devoted to the make of Bessemer steel rails and tiers are kept fairly going; but engineering branches and railway waggon builders are by no means well off for work.

The position of the coal trade varies a good deal, owing to some of the pits having good contracts on hand, whilst others are scarcely able to find two or three days work per week for their operatives. Some of the pits in the West Yorkshire district, where a good quantity of steam coal is raised, are doing a fair business; but on the whole trade is not only flat, but prices are remarkably low and unprofitable. From Sharlstone and St.

John's collieries a fair tonnage of house coal was last month sent to London by rail, and a good quantity of hard coal to Goole for exportation. Some of the West Yorkshire thin-seam pits are doing a tolerable business in coal for manufacturing purposes.

The South Yorkshire collieries producing house coal are sending scarcely an average tonnage to the Metropolis by rail, owing to the high carriage rates demanded by the railway companies. Seeing that the Great Northern Company declined to make any concessions, attention has been called to a scheme for carrying coal from the district *viâ* Boston Deeps to London and Paris, and it is said that a limited liability company is being formed, with a capital of £1,000,000, with power to increase. The Company is to be known as "The Seaborne Coal and Wood Company, Limited." The coal is to be conveyed in sacks holding two hundredweight, and a great saving in carriage rates is promised. At the present juncture coalowners here will look with great interest on the movement, as they declare they are practically shut out of the London market.

The steam coal trade so extensively carried on in the southern part of the coal-field is brisk, the whole of the collieries connected with the Steam Coalowners Association having orders for all they can raise. This quality of coal is, however, found with the house coal, and hence the difficulty of stacking the one and exporting the other. The Manchester, Sheffield, and Lincolnshire and the Midland Railway Companies are carrying a large tonnage to the Humber ports, where the exports of late have kept up very well. There is, however, scarcely so much demand for hard coal for smelting purposes.

Makers of coke are not over well supplied with orders. This in a great measure arises from the increase which has of late years taken place in the production of coke in South Yorkshire, and to the quietness which prevails in some of the iron-smelting districts, one firm in North Lincolnshire having already damped down two out of four furnaces in blast. The erection of coke-ovens, however, proceeds rapidly, and it is to be feared that many of them will have to remain idle even when they are finished.

The wages question is beginning to be brought before the men, and at several places notices to quit their employment have been served upon the miners engaged. In some instances the day men have submitted to a reduction rather than contest the matter with the owners.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

There has been a somewhat improved demand for Durham gas coals over the past fortnight. A considerable amount of steam tonnage has been taken up to carry gas coals on to Cronstadt and some of the other larger ports in the Upper Baltic. The great gas-works at St. Petersburg, Moscow, and other large cities, are commencing to improve their stocks. A pretty good business is also being done with the smaller ports of the Baltic. The present somewhat low rate of freights encourage the gas companies to lay in supplies. A fair amount of business is also doing in the home trades. Generally speaking, the gas coal trade is pretty steady. Best steam coals have also come more into demand. In fact, the shipments of coals all round have been greater over the past fortnight than on the previous two weeks. The largest business is doing in best coals, but there is a considerable amount of competition amongst seconds. There is no alteration in prices in any sorts. Coke is selling better, but the manufacturers are unable to secure an advance in rates.

The freight market may be expected to rise a little from this time until the end of September or the middle of October. But even this very much depends on circumstances. Seaborne coal of all descriptions has to sustain a very keen competition with railways in all the home markets. This has become so severe that even small sailing-vessels of from five to ten keels have been unable to find profitable employment over the past three months. And at present there is scarcely any business for them on offer which will pay. An odd steamer or two pick up now and then a freight to London at about 3s. 10½d per ton; but nine-tenths of the carrying trade thence is done by the colliery steamers or by boats belonging to gas coal contractors. It is very problematical whether coasting freights will improve in the autumn or not; they could not be lower than they are at present.

The manufacturing trade of these districts is, if anything, better, and the iron market has been stronger over the fortnight; this has reacted favourably upon other trades. Chemicals have been more in demand, and prices have advanced 2 or 3 per cent. all round in this trade. Fire-clay goods of the very best sorts still show good shipments; but second class still fall off in demand. The timber trade is without change. Lead is a little lower in price, but other metals keep pretty firm. There have not been many shipments of gas or water pipes abroad lately; but sanitary pipes show continued large exports.

INCREASE IN THE RATEABLE VALUE OF THE CAMBRIDGE GAS AND WATER COMPANIES UNDERTAKINGS.—The Cambridge Union Assessment Committee recently called in professional assistance to estimate the value of the Gas and Water Companies property for rating purposes. Comparing the value this year with what it was in 1870, it is said the amount is raised from £2411 gross rental, £2200 rateable value, in the case of the Gas Company, to £5970 gross rental, £4519 rateable value; and for the Water Company, from £1150 and £1000 to £3085 and £2807 respectively.

PROPOSED EXHIBITION OF GAS APPARATUS IN DUBLIN.—Last week we noticed the project by the Belfast Corporation Gas Committee to hold an exhibition of gas apparatus next month, and to-day we publish an advertisement announcing that the Alliance and Dublin Consumers Gas Company intend having a similar exhibition—of gas-engines, cooking-stoves, heating and ventilating apparatus, burners, and chemicals in connection with gas manufacture—from the 6th to the 18th of September. The date of this exhibition has been so arranged that exhibitors at Belfast will have time to send their goods on to Dublin, and then to Glasgow for the 28th of September, if they wish to do so.

SALTCOATS GAS COMPANY.—The annual general meeting of this Company was held on the 7th inst., when the accounts for the year ended April 30 last, were presented. They show that the consumption of gas by private consumers during the year amounted to 4,255,700 cubic feet, which at 5s. per 1000 feet brought a revenue of £1031 19s. 5d.; the residual products realizing £109 5s. 7d. The expenditure, including coals and cartage, was £288 13s. 8d., which was equal to 1s. 1½d. per 1000 feet of gas made; the total ordinary expenditure being £716 19s. 1d., equal to 2s. 10d. per 1000 feet of gas made. The "Abstract of Coal Account and Product of Gas," appended to the accounts, shows that during the year 557 tons 7 cwt. of coal and shale were used, estimated to produce 4,977,725 cubic feet of gas. The actual quantity made, as indicated by the station-meter, was 5,053,000 feet, equal to rather over 9066 feet per ton. The gas used by consumers amounted to 4,255,700 cubic feet; used in 54 street-lamps, which are supplied free of charge, 169,992 feet; used on works, &c., 35,000 feet; thus leaving unaccounted for, 592,308 cubic feet, or 11·72 per cent. of the make. The accounts were approved of, and a dividend of 10 per cent. was declared. It was agreed to reduce the price of gas from 5s. to 4s. 7d. per 1000 from the 1st of May last.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

At a recent meeting of the Directors of the Dysart Gaslight Company, the price of gas was reduced 5d. per 1000 feet—from 6s. 3d. to 5s. 10d.

The annual meeting of the Burntisland Gas Commission was held on Monday, the 12th inst., when it was unanimously agreed to reduce the price of gas from 6s. 8d. to 6s. 3d. per 1000 cubic feet for the next six months.

A dividend of 8 per cent. was declared at the annual meeting of Shareholders of the Markinch Gaslight Company, held on the 12th inst. For many years the dividend was 10 per cent., but during last year many important improvements were carried out at the works, thereby making the expenditure greater than usual. The street-lamps are supplied by the Company free of charge. Mr. D. Watson was appointed Treasurer, in room of Mr. J. Foote, deceased. All the retiring Directors were re-elected.

The Corporation Gas Commissioners of Arbroath had their annual accounts under consideration at a meeting held on Monday of last week. The accounts showed that there was a surplus profit on the year's working amounting to £761 8s. 8d., as against £740 7s. 6d. on that of the previous year. In his annual report for the year ending May 30, 1880, the Manager (Mr. D. Terrace) stated that the quantity of coal consumed during the year was 3559 tons, as against 3308 tons in the year 1878-79, being an increase of 251 tons, or 7½ per cent. The make of gas was 37,697,000 cubic feet, or 2½ millions more than in the previous year, or an increase of 7¼ per cent. The amount of gas made per ton of coal carbonized was 10,591 cubic feet, while the gas sold per ton was 9345 cubic feet, or about the same quantity as in the year 1878-79. During the past year the unaccounted-for gas was 11·76 per cent. of the quantity, as compared with 12·13 per cent. in the previous year, the reduction being 0·37 per cent. The percentage of leakage is lower than the average of most towns in Scotland. About five years ago it was between 17 and 18 per cent., so that there has been a saving on this head of at least £400 per annum. After a long discussion it was resolved by a majority of 10 to 4 to approve of the recommendation made by the Committee of Management—namely, to continue the price of gas for the current year at the rate of 5s. 2½d. per 1000 cubic feet, the same as last year, with a rebate or discount of 2½d., making the rate equal to 5s. per 1000 feet; and to pay over one-half of the surplus profits as usual to the Town Council, for public improvements. The minority were in favour of the price being reduced to 5s., and a decided opinion was expressed that the gas supply undertaking should stand by itself, all the profits being spent in reducing the price of gas.

A reduction of 5d. per 1000 cubic feet has been made in the price of gas by the Broughty Ferry Police Commissioners, the charge for the current year being 4s. 2d. per 1000 cubic feet, with the usual 5 per cent. discount for prompt payment. The Gas Committee have purchased their coal this year at a reduction of something like 2s. 2d. per ton, giving a saving equal to about £200. It is very creditable to the Manager, Mr. Myers, that he has been able to reduce the item of unaccounted-for gas from 16 to 9¾ per cent., which is certainly well-nigh the lowest percentage of leakage of any town in Scotland. The Convener of the Gas Committee, Mr. Scott, says he believes it to be, without exception, the lowest.

In regard to the contemplated transfer of the gas supply undertaking of Coupar Angus to the Police Commissioners of the burgh, it was intimated by the Clerk, at a meeting of the Commissioners held on Monday, the 12th inst., that he had communicated with the Clerk to the Gas Company, and that the latter had stated that he had no power to call a meeting of the Directors for the purpose of negotiating on the subject. It would seem, therefore, that there is but little prospect of the adoption of the Gas Act in the meantime.

In connection with the resolution of the Forfar Gas Corporation to apply to Parliament for additional borrowing powers to the extent of £4000, an inquiry, at the instance of the Home Secretary, took place last Wednesday, before Sheriff Robertson. Mr. Gordon, Clerk to the Commission; Mr. M'Hardy, Treasurer; Bailie Laird, Convener; and Mr. D. B. Esplin, Manager, gave evidence as to the town's increased requirements and the necessity for extending the manufacturing power, the extensions to meet which had rendered the present application necessary, the Corporation having already exhausted the sum which they were empowered to borrow under their Act. No opposition was made to the petition. The Sheriff explained that all he had been asked to do was to take such evidence as was tendered him, and to report thereon. His lordship's report was transmitted to the Home Office the following day.

The annual general meeting of the Laurencekirk Gas Company was held last Wednesday—Mr. D. A. Pearson presiding. A balance-sheet was submitted, which showed that the usual dividend of 7½ per cent. could be paid, while still leaving a balance on the right side. Satisfaction was expressed by the meeting with the state of the Company's affairs, and it was agreed to pay the dividend recommended by the Directors.

At the last meeting of the Town Council of Aberdeen, Bailie Macdonald, speaking with reference to the acceptance by the Gas Committee of tenders to the extent of 24,000 tons of coal at a total cost of £21,775, said there would be a saving of £850 on the contracts for coal this year. Under the able convenership of Bailie Donald, the price of gas had been reduced to 4s. 2d. per 1000 feet. He believed their gas would now be the cheapest in the country, taking into account the difference of the price of carriage of the coal from the pit mouth, and the fact that the gas was of the best quality.

The first statement of accounts of the Town Council of Peterhead, acting as Gas Commissioners under the Burghs Gas Supply (Scotland) Act, 1876, was recently issued. It applies to the period from Nov. 23, 1878, to May 18, 1880, and was examined and approved of at a statutory meeting of the Commissioners held on Monday, the 12th inst. There was a fear that the undertaking would have some difficulty in showing a satisfactory account at this time, but it has fortunately turned out that the balance is on the right side. For the present year the price of gas is to be continued at 7s. 6d. per 1000 feet—the same as last year—with 5 per cent. discount for early payment of accounts, and the gas consumed in the public lamps is only charged at half price. The present Manager, Mr. R. Smith, has his work cut out for him, if the other parts of the works and plant are at all like the street-mains, for since he entered upon his duties it has been found that the unaccounted-for gas is fully 35 per cent., which is something fearful to contemplate.

It has just been reported to the Police Commissioners of Inverness by the Town Chamberlain, that the profit on the gas supply undertaking for the past year amounted to nearly £900, and justified the recommendation that the price of gas should be reduced from 7s. 6d. to 6s. 8d. per 1000 cubic feet.

A dividend of 10 per cent. has been declared on the profits of the past year by the Lerwick Gaslight Company, and a reduction of 1s. 8d. per 1000 feet has been made on the price of the gas.

The annual general meeting of the Girvan Gas Company was held on Thursday, the 8th inst. After some consideration, the report issued by the Directors was unanimously adopted, and a dividend of 5 per cent. was declared. Thereafter the meeting elected the following Directors:—Messrs. W. Gouldie, J. Graham, J. M'Cracken, and W. Howie.

Last Saturday's *Citizen*, in reference to the Municipality of London Bill, says: "We are informed, on the highest authority, that the one particular member of the Cabinet whose opinions upon Municipal Government, founded upon a large personal experience, would naturally have the most weight with his colleagues, is decidedly favourable to the creation of municipalities in the various parliamentary boroughs of the Metropolis, with a Joint Committee, presided over by the Lord Mayor, for all matters equally affecting the whole, such as main drainage, gas, and water. If this be so, why does not the Corporation seize the favourable opportunity, and draft a Bill founded on those lines? and so effectually supersede all future attempts at grasping with this large subject, which many think are sure to meet the same end as that which the House—it is said, scornfully, but as we think, very improperly—declined even to consider on Tuesday last."

Boston Gas Company.—At the annual meeting of this Company recently held, the Directors report which was presented showed that the profits of the Company for the past year were £4520 12s., against £4705 15s. 2d. in the previous year. There was a decrease in the amount of gas consumed, both by householders and public companies. The report was adopted, and the full parliamentary dividend on both classes of shares was ordered to be paid. The report also recommended that the remainder of the Company's loan of £1500 should be paid off in January next, and this was agreed to. Messrs. Wren, Cooper, and Mawer, the retiring Directors, were re-elected. It was also agreed that in future an interim dividend of 4½ and 3½ per cent. be paid, on the 1st of March annually, on both classes of the Company's shares. Some discussion took place as to whether the price of gas to private consumers should not be reduced, but the prevailing opinion of the meeting was that the Company should first clear themselves of their liabilities.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

2666.—Davey, G. W., Barking, Essex, "Improvements in the distillation of coal tar, and in the apparatus employed therein." June 29, 1880.

2679.—Schloesser, R., Manchester, "Improvements in the construction of water-meters." A communication. June 30, 1880.

2683.—Lake, W. R., Southampton Buildings, London, "Improvements in pumps." A communication. June 30, 1880.

2714.—Anderson, A., Brixton, London, "Improvements in apparatus for forcing and discharging water, air, and other fluids and gases." July 2, 1880.

2784.—Domeier, A., Botolph Lane, and Marzell, J., Russell Square, London, "Improvements in the manufacture of artificial alizarin." July 7, 1880.

2787.—Pitt, S., Sutton, Surrey, "Improvements in gas apparatus." A communication. (Complete specification.) July 7, 1880.

2804.—Aird, J., Lambeth, London, "Improvements in or applicable to the valves of gas mains or pipes for the purpose of maintaining a tight joint." July 8, 1880.

2816.—Edmonds, E., Fleet Street, London, "A new process and improved means for carburetting air, and rendering it either explosive or illuminative at will." A communication. July 8, 1880.

2874.—Trotman, S., Wanstead, Essex, "Saturating atmospheric air or gases used for heating or illuminating purposes with liquid hydrocarbon by an improved means or apparatus." July 12, 1880.

2881.—Wilde, J., Sydenham Hill, Surrey, "Improvements in taps." July 13, 1880.

2886.—Heaton, J. C., Rotherham, York, "Improvements in holders for gas glasses." July 13, 1880.

2924.—Edwards, C., Bickley, Kent, "Improvements in the treatment of gas to be used for heating or illuminating purposes." A communication. July 15, 1880.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

161.—Harlow, B., Macclesfield, Chester, "Improvements in steam, hot water, hot air, and other boilers, partly applicable to packing rings for steam, water, and gas joints." Jan. 14, 1880.

191.—Roberts, S. H., Coleman Street, London, "Improvements in pipe joints." Jan. 16, 1880.

205.—Atkins, G., Birmingham, "Improvements in shade-holders for gas and other lamps." Jan. 16, 1880.

305.—Kingsford, C., Upper Clapton, London, "Improvements in apparatus for the generation of steam, the manufacture of coke and gas, and for similar purposes." Jan. 23, 1880.

332.—Fielding, J. R., and Butterworth, B., Rochdale, Lancs, "Improvements in or applicable to gas burners or lights." Jan. 26, 1880.

432.—Brouardel, E. P., Paris, "Improvements in gas-pressure registers." Jan. 31, 1880.

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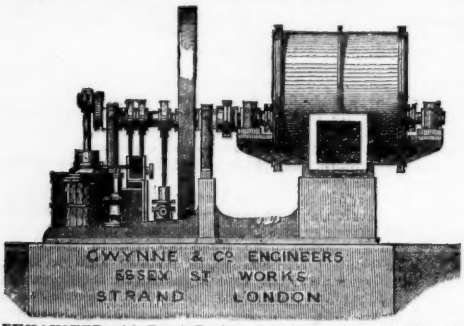

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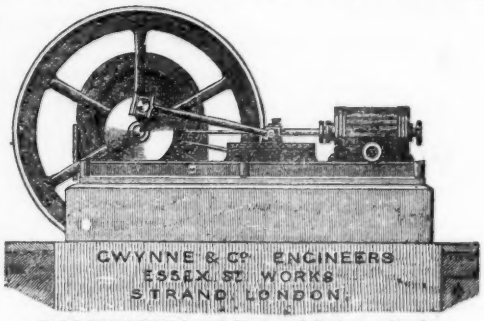

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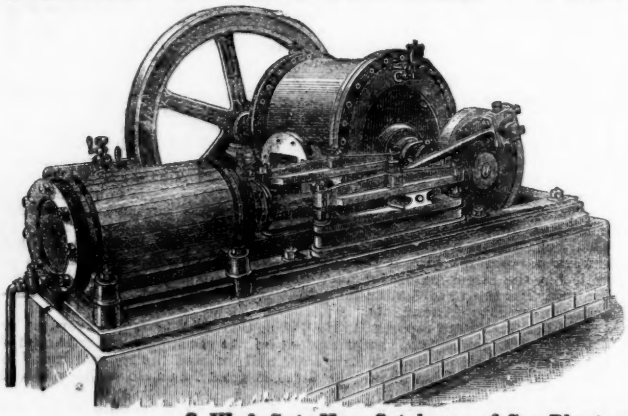

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[*SEE ALSO ADVERTISEMENT, PAGE* 118.]

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A man having a knowledge of Portuguese preferred.
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FOR SALE.—A Second-hand Square STATION-METER, 30,000 per hour; now being removed from the Manchester Corporation Gas-Works, and being replaced by a larger one. To be Sold a bargain.
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HOGSTHORPE, LINCOLNSHIRE.

TO BE SOLD, by Private Contract, or LET, either from year to year or for a term of years, with immediate possession, the GAS-WORKS at Hogsthorpe, near Alford, Lincolnshire, with the Fixtures and other Appendages necessary for working the same, all of which are in good condition.
For all particulars apply to Mr. HENRY SARGISSON, Hogsthorpe, near Alford, LINCOLNSHIRE.

THE Ringwood Gas Company have the following PLANT for immediate Sale cheap:—
One Length U-shaped Cast-Iron Hydraulic Main, 17 in. by 17 in. by 7 ft. 6 in. long; Three Cast-Iron Retorts, U-shaped, 12 in. by 12 in. by 7 ft. 6 in. long; Three Mouthpieces; Six Wrought-Iron Lids, and Three Crossbars for same; Three Ascension-Pipes, 4 in. by 3 in. by 7 ft. 6 in. long; Six 3-in. H-Pipes; Seven 3 in. Dip-Pipes and other sundries.
For particulars and price apply to W. S. M'GREGOR, Manager, Gas-Works, Ringwood, HANTS.
July 13, 1880.

TENDERS required for a new Purifier, 9 ft. by 6 ft. by 4 ft. deep, with Sieves, Lifts, 6-in. Connection, and Four-way Valve. To be fixed, not under cover.
Tenders to be addressed to GEO. WHITMAN, Gas Company's Office, Aspley, near Woburn, BEDS.

GAS PLANT FOR SALE.

THE Maidstone Gas Company having enlarged their Works, offer the following Apparatus for Sale in good condition:—
SCRUBBERS.—One Tower Scrubber 30 ft. high by 10 ft. diameter, with Distributor, and partly fitted with Livesey's boards.
CONDENSERS.—One Set of Annular Condensers, consisting of 9 Pipes 17 ft. high, outer diameter 2 ft. 6 in., fitted with 12-in. Valves complete.
ENGINES.—Two 12-Horse Power Horizontal Engines in very good condition.
STATION-METER.—By Milne and Son, in first-class condition, ornamental case, with Valves and Bye-pass complete; to pass 20,000 cubic feet per hour.
HYDRAULIC MAIN.—Six 8 ft. by 18 in. Hydraulic Main D wrought iron; 24 8 ft. 9 in. by 18 in. Hydraulic Main D wrought iron. Nearly new.
RETORTS.—31 Rounds, 15 in. diameter and 9½ ft. long, in two pieces. 2 Ovals, 21 in. by 15 in. and 9 ft. long, in one piece. All of Stourbridge Fire-Clay, and in good condition.
For further particulars and price apply to
JOHN WEST, Engineer and Manager.
Gas Works, Maidstone, April 21, 1880.

THE Gloucester Gas Company, ceasing to manufacture gas at their old works, will have the undermentioned APPARATUS for Sale about the beginning of August, viz.:—
About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.
Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12-in. Connections.
Exhauster (Jones) to pass about 15,000 feet per hour.
Exhauster (Beales) to pass about 25,000 feet per hour.
Two Vertical Steam-Engines, each about 6-horse powe with Pulleys, and Shafting used for driving the above.
Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.
4-horse power Horizontal Steam-Engine.
Three 4-in. Pumps, with cranked Shafting and a pair of Mitre Wheels.
Two Purifiers, 16 ft. by 8 ft., with six 12-in. Slide-Valves and 12-in. Connections.
Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.
Gasholder, Double Lift, capacity 100,000 feet.
Gasholder, Double Lift, capacity 240,000 feet.
One 12-in. Governor, by Wright, London, with 12-in. Valves, Bye-Pass, and Connections.
Two 12-in. four-way faced Valves, by Cockey.
For further information, &c., apply to the undersigned.
R. MORLAND, Engineer.

TO COAL AND CANNEL PROPRIETORS.

THE Gas Committee of the Corporation of Warrington are prepared to receive TENDERS for 9500 Tons best quality of COAL for Gas and Coking purposes; and 4500 Tons CANNEL, for One or Two years, from the 1st day of August next.
Specifications and conditions of contract may be had from the undersigned; and sealed tenders, endorsed "Tender for Coal," must be lodged at my Offices not later than Thursday, the 22nd inst.
The Committee do not bind themselves to accept the lowest or any tender.
JAMES PATERSON, Manager.
Gas-Works, Warrington, July 9, 1880.

THE Gas Committee of the Leeds Corporation are prepared to receive TENDERS for the RECONSTRUCTION in Wrought Iron of the FRAMING of Three GASHOLDERS, of about 100 ft. diameter, and the Conversion of the same from Two Lifts to Three Lifts. Two of the Holders to be completed by the 1st day of November next. The Contractor to take down and remove existing cast-iron columns and wrought girders at his own cost, and make allowance for their value.
Plans and specifications can be had on application to Mr. H. Woodall, Engineer.
Endorsed tenders to be addressed to the Chairman, Gas Offices, Boar Lane, not later than Monday, the 26th inst.

TO COALOWNERS.

THE Gas Committee of the Leeds Corporation solicit TENDERS for the Supply of CANNEL and Best GAS COALS (screened or nuts) for Ten months ending 30th of June, 1881. Each intending Contractor to send at once sample of every description of Coal to be offered—if sent by cart, to Gas-Works, New Wortley, and if by truck to Gas-Works siding, Geldard Junction, Leeds.
Forms of tender may be had on application to the Engineer, Gas-Works, Meadow Lane, or to the Secretary, Gas Offices, Boar Lane.
Endorsed tenders to be addressed, Chairman, Gas Offices, Boar Lane, not later than Wednesday, the 18th of August next.

THE Middleton and Tonge Improvement Commissioners are prepared to receive TENDERS for the Purchase of the TAR and AMMONIACAL LIQUOR, together or separate, for One, Two, and Three years, made at their Gas-Works, Tonge, Middleton.
Sealed tenders, addressed to the Chairman of the Gas Committee, to be delivered at the Office of the Clerk, on or before Monday, the 2nd of August, 1880, endorsed "Tender for Tar or Ammoniacal Liquor."
The Commissioners do not bind themselves to accept the highest or any tender.
FREDERICK ENTWISTLE,
Clerk to the Commissioners.
Commissioners Rooms, Tonge, Middleton,
July 16, 1880.

CIRENCESTER GAS COMPANY, LIMITED.

THE Directors are prepared to receive TENDERS for the Supply of 800 Tons of Real Old Silkstone GAS COAL, 1000 Tons of Best Forest of Dean GAS COAL, and 300 Tons of through Welsh COAL, to be delivered at Cirencester Station during the next Twelve months, in such quantities and at such times as the Company's Manager may direct.
Also for the Purchase of the Company's COKE, to be removed from the Works as required by the Manager.
Tenders to be sent to J. BUCHAM, Secretary to the Gas Company, 76, Castle Street, CIRENCESTER, on or before the 26th of July inst.

TOTTENHAM AND EDMONTON GAS-LIGHT AND COKE COMPANY.
Pursuant to a Requisition signed by the necessary statutory number of Shareholders, NOTICE is hereby Given that an EXTRAORDINARY MEETING of the SHAREHOLDERS in the above Company will be held at the Works, Willoughby Lane, Tottenham, on Saturday, the 31st day of July inst., at Half-past Two o'clock in the afternoon precisely, for the purposes following, viz.:—
"To consider the charges made, and proceedings taken, against two of the Directors of the Company with reference to a free supply of Gas at their private houses for some time enjoyed by them; and the course that it is desirable for the Shareholders to take in regard to the said free supply, charges, and proceedings; and to pass such resolutions with respect thereto as may be deemed just, fitting, and expedient."
By order of the Board of Directors,
JAMES RANDALL, Secretary.
Offices, Edmonton, Middlesex, July 17, 1880.

CAMBRIDGE UNIVERSITY AND TOWN GASLIGHT COMPANY.

TO TAR DISTILLERS AND OTHERS.

THE Directors of this Company will at their meeting on the 29th inst. be prepared to receive TENDERS for the Surplus TAR produced at these Works for a period of One or Two years from November next. Probable make about 140,000 gallons per year.
Sealed tenders, addressed to the Chairman, to be delivered not later than the 27th inst.
Further particulars may be had from
JAMES WEEKS, Manager.
Gas Office, Cambridge, July 1, 1880.

TENDER FOR TANK AND HOLDER.

THE Directors of the Midhurst Gas Company, Limited, are prepared to receive, in one estimate, on or before the 31st inst., TENDERS for Contracts for Excavating, Constructing, and Building a BRICKWORK TANK, and also a substantial GASHOLDER, 50 ft. by 16 ft., erected complete with Seven Columns, to Connect existing Inlet and Outlet, and to provide Valves, &c., in accordance with plans and specifications which may be seen and information had on application to the undersigned.
The Directors do not bind themselves to accept the lowest or any tender.
EDWIN ELLCOME, Secretary.
Midhurst, July 14, 1880.

THE NORTHWICH GASLIGHT AND COKE COMPANY, LIMITED.

THE Directors invite Tenders for the Supply of 2000 Tons of GAS COAL, delivered at Northwich Railway Station, in quantities as required, in Gas Company's own waggons, or in Colliery Company's waggons, as agreed upon.
All tenders to be sent in not later than Saturday, July 31, sealed and endorsed "Tender for Gas Coal," and addressed to the Chairman.
For any further information apply to Mr. B. Askew, Manager.
The Directors do not bind themselves to accept the lowest or any tender.
By order,
HENRY PICKERING, Secretary.
Northwich, July 15, 1880.

MACCLESFIELD CORPORATION GAS-WORKS.

COAL AND CANNEL CONTRACTS.

THE Gas Committee are prepared to receive TENDERS for the Supply of the whole or part of 3000 Tons of CANNEL and 12,000 Tons of GAS COAL. Deliveries free at Macclesfield to commence as follows:—The Cannel, July, 1882, extending One year, and in such quantities as may be required; the Coal, July, 1881, extending two years in such quantities as may be required.
Tenders, specifying the description of Coal or Cannel, the pits at which they are to be raised, and the terms for net monthly payments, to be sent in not later than Saturday, July 24, addressed to the Chairman, Gas Committee, Town Hall, Macclesfield.
The Committee do not bind themselves to accept the lowest or any tender.
THOMAS MOORE, Engineer and Manager.
July 12, 1880.

TENDERS FOR COALS.

THE Directors of the Dorking Gas Company are prepared to receive TENDERS for the Supply of about 1500 Tons (or such other quantity as may be required) of New Pelton, Pelaw Main, Penrith, or other approved GAS COAL, to be delivered free at the Dorking Station of the South-Eastern Railway.
Payment, by cash, two months from date of delivery, which can be arranged by application after the first delivery of 100 Tons, which must be on the Company's Works on or before Aug. 17.
Tenders to be addressed to the undersigned by July 27 next.
The Directors do not pledge themselves to accept the lowest or any tender.
WALTER PHILPS, Secretary and Manager.
Gas-Works, Dorking, July 14, 1880.

NEW VOLUME OF WEALE'S RUDIMENTARY SERIES.
This day, 12mo, limp cloth, 4s. 6d., or cloth boards 5s. (postage 4d.).

THE Construction of Gas-Works and the Manufacture and Distribution of Coal Gas Originally written by Samuel Hughes, C.E. Sixth Edition Re-written and much Enlarged by WILLIAM RICHARDS, C.E. With numerous Illustrations.
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For particulars, price, &c., apply to MR. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

Prices are Reduced.

BOROUGH OF BELFAST CORPORATION GAS-WORKS.

EXHIBITION OF GAS ENGINES, STOVES, OVENS, BURNERS, AND OTHER APPLIANCES FOR THE ECONOMIC USE OF GAS.

THE Gas Committee of the Belfast Corporation have determined to hold an EXHIBITION as above stated in the Grain Market, Belfast, to commence on the 16th of August, and to continue open until the 28th of August.

Full particulars may be had from the Manager of the Gas-Works, who will also forward to intending Exhibitors form of application for space and copy of conditions under which the Exhibition is to be held.

By order of the Gas Committee,
JAMES STELFOX, Manager.
Gas-Works, Belfast, July 9, 1880.

ALLIANCE AND DUBLIN CONSUMERS GAS COMPANY.

EXHIBITION OF GAS-ENGINES, COOKING-STOVES, HEATING AND VENTILATING APPARATUS, BURNERS, AND CHEMICALS IN CONNECTION WITH GAS MANUFACTURE.

THE Directors of the Alliance and Dublin Consumers Gas Company have made arrangements to hold an EXHIBITION as above stated, in the Dublin Exhibition Palace, commencing on the 6th of September, and to remain open until the 18th of September.

Any information or further particulars can be had from the Secretary and Manager of the Company, Mr. W. F. Cotton.

Exhibitors desirous of showing their goods both at Dublin and Belfast will have ample time after the Belfast Exhibition closes, on the 28th of August, to forward their goods to Dublin in time for the Exhibition there.

By order,
W. F. COTTON, Secretary and Manager.
Dublin, 114, Grafton Street, July 15, 1880.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Radcliffe and Pilkington Gas Company are prepared to receive TENDERS for the Purchase of the Surplus TAR produced at their Works, Egerton Street, Radcliffe, for the period of One year from August, 1880.

Any further information may be obtained on application to the undersigned, to whom tenders, stating the price per ton of 20 cwt., must be sent on or before the 26th inst.

The Directors do not bind themselves to accept the highest or any tender.

ANDREW DOUGALL, jun., Manager and Secretary.
Gas-Works, Radcliffe, near Manchester, July 9, 1880.

TO COAL MERCHANTS.

THE Directors of the Radcliffe and Pilkington Gas Company are prepared to receive TENDERS for the Supply of Best Screened GAS COAL and CANNEL, to be delivered at the Radcliffe Goods Station in quantities as they may from time to time require, for a period of One, Two, Three, or more years as may be agreed upon, commencing Dec. 1, 1880.

It is estimated that 6000 tons of Coal and 3000 tons of Cannel will be required per annum.

Persons tendering are requested to name the colliery from which they propose to supply.

Tenders must be sent to me on or before the 26th inst.

The Directors do not bind themselves to accept the lowest or any tender.

ANDREW DOUGALL, jun., Manager and Secretary.
Gas-Works, Radcliffe, near Manchester, July 9, 1880.

THE Hindley Local Board are prepared to receive TENDERS for the Supply of about 3000 yards of 4-in. and 730 yards of 3-in. WATER-PIPES, with the necessary Irregular Pipes.

Full particulars can be known on application to the undersigned. By order,
STEPHEN HOLT, Clerk to the Board.
Offices, Cross Street, Hindley, July 12, 1880.

LOCAL BOARD OF HEYWOOD.

TO CONTRACTORS AND BUILDERS.

THE Heywood Local Board are prepared to receive TENDERS for the following:—

Contract No. 1.—The Erection of a 'PURIFYING-HOUSE of Brick relieved with Stone, on the site of their Gas-Works, Hooley Bridge, Heywood.

The drawings and specification may be seen at the Board's Offices, and at the Offices of the Engineer, Mr. Thomas Newbigging, 5, Norfolk Street, Manchester. Copies of the specification, bill of quantities, and form of tender may be obtained from the Engineer on payment of One Guinea, which will be returned on receipt of a *bonâ fide* tender.

Sealed tenders, endorsed "Tender for Purifying-House, Contract No. 1," to be addressed to the Chairman of the Gas Committee, and delivered to the undersigned not later than the 26th of July inst.

The Board do not bind themselves to accept the lowest or any tender.

By order,
JOHN BANKS, Clerk to the Local Board.
Office of Local Board, Heywood, July 12, 1880.

Imperial METER COMPY.,

LIMITED,

Makers of THE IMPROVED DRY GAS-METERS, THE PATENT WET GAS-METERS, Special Meters for Public Lighting, STATION-METERS, Governors, &c.

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TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

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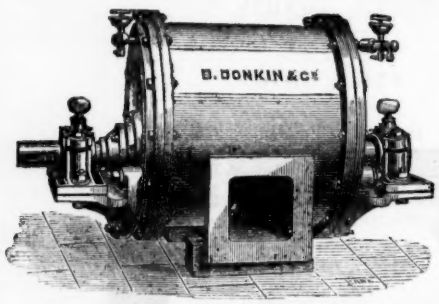

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[J. BEALE'S.]

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Pamphlet on the advantages of the above, with Modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,

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G. R. HISLOP'S PATENT REGENERATIVE PROCESS

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The Patentee having devoted more time and attention to this subject than perhaps any other person living, is now in a position to recommend the adoption of this process to Gas Companies and Corporations with the utmost confidence in its practical utility, convenience, and economy. 1st. It restores the spent Lime at from one-third to one-half its original cost, apart from its undoubted convenience and the economy of space. 2nd. There is practically no limit to the duration of the Lime. 3rd. The cost of apparatus for the introduction of the process is very moderate and exceedingly durable. 4. The Patentee supplies special bricks and castings, erects and proves the process on the most favourable terms.

The process, in operation, may be seen at the Corporation Gas-Works, Paisley, where the Lime has been restored 120 times. Inspection is cordially invited.

For Terms, apply to GEO. R. HISLOP, F.C.S., Engineer, Gas-Works, PAISLEY, N.B.

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Mediæval Pattern Burner (Registered).

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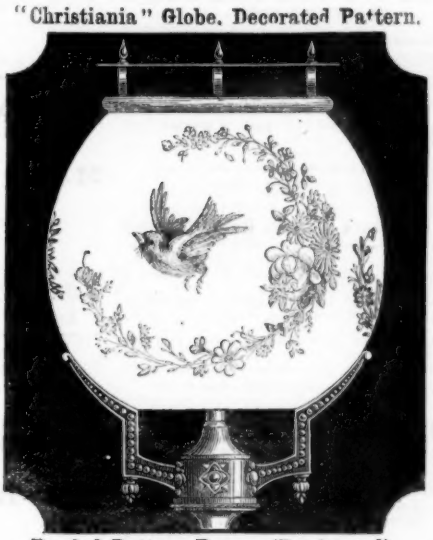

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All Burners and Glass bear my Trade Mark.

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J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & Co., GHENT, will receive immediate attention.

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Manufacture and Erect
HYDRAULIC CRANES
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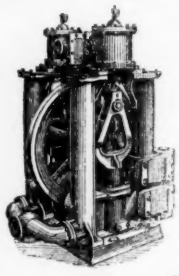

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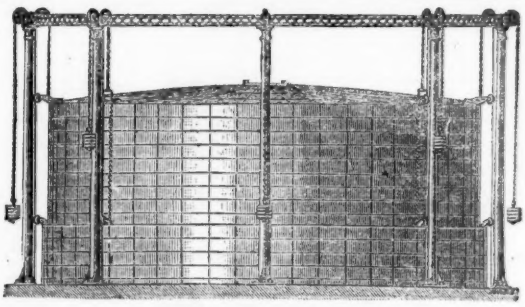

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ESTIMATES FOR GAS-WORKS OF ANY SIZE.
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So long as the valve remains open, so long there will be correct registration, and this being now well known, great confidence is felt in this Meter by both sellers and buyers of gas.

This result is not due to "compensation," but to *self-regulation*, the drum adapting itself to the existing condition of the water line, and, instead of varying with it, remaining, under every change of level, of practically fixed capacity.

Nothing need be said of "Compensating" Meters, their function being to correct, in a more or less complicated and necessarily imperfect manner, the inherent defects of the "common" drum. The invention of Messrs. WARNER & COWAN has removed any real necessity for the common drum, and rendered Compensating Meters of all kinds superfluous.

Original Licensees and Manufacturers,

W. & B. COWAN,

(ESTABLISHED 1827,)

WET & DRY GAS-METER MANUFACTURERS,

Manufacturers of

THE AUTOMATIC PRESSURE CHANGER,

(WM. COWAN'S PATENT,)

CHURCH STREET, MILLBANK STREET, **LONDON, S.W.**	DUTTON STREET, NEW BRIDGE STREET, **MANCHESTER.**	BUCCLEUCH STREET WORKS, **EDINBURGH.**

The understated declaration with which we introduced our apparatus when the Argand system was in the full tide of its fame, has been fully borne out by general experience, namely—

"THE FLAT-FLAME IS THE ONLY PRACTICABLE SYSTEM FOR STREET LIGHTING; and, 'in actual use,' yields as much light with Common Gas, and more with Cannel Gas, than any Argand System."

CHARLES HUNT, Esq. (President of the British Association of Gas Managers), in his Inaugural Address to the members at their annual meeting, held in London, June, 1880, said: "Rivalry has stimulated into being, for outdoor purposes mainly, Burners of large power, that have fully maintained the superiority of coal gas over the electric light. To Mr. Bray our thanks are due for his development of the FLAT-FLAME BURNER into a lighting medium of a very high order, *and for his vindication of its claims to practical consideration.*"

The above declaration was received with marked applause by the crowded meeting.

BIRMINGHAM LAMP TESTS.

AFTER the most exhaustive series of experiments, extending over more than twelve months, with the most extensive assortment of Burners and Lanterns of large lighting power ever brought together, the Birmingham Authorities have

ADOPTED BRAY'S SYSTEM

for their Street-Lighting Improvements, for which purpose Sixty-Five 100-candles power Lanterns of medium lighting power are being fixed.

The apparatus used in the above tests were all of our usual medium lighting power class, and the tests showed that we sacrifice a considerable amount of lighting power for general efficiency. The tests further showed that our 80*-candles* HIGHEST *lighting power burner yielded* 3·51 *candles per foot of gas—the quality being* 16·75 *candles* (3·35 *per foot*) *by the standard—which was a higher result than that yielded by any other flat-flame burner, though copies of our Slit-Unions, enlarged and improved by us Jan.,* 1879, *were used by our competitor; and higher than the* 80*-candles power Argands.*

NOTE.—The above is the most conclusive answer to the ever-changing and misleading statements which are being made by our competitor, with the object of taking from us the honours we have secured in open contest.

Extract from the *Leeds Mercury*, April 1, 1880.

At the meeting of the Leeds Town Council, March 31, Alderman Gaunt moved that the Council approve of the acceptance by the Corporate Property Committee of the tender of Messrs. Geo. Bray and Co. for the supply of 21 new lamps, to be placed upon the pillars round the Town Hall. The Committee had tested Sugg's and other lamps, and found Messrs. Bray's the best. It was intended to have two 200-candles power and two 100-candles power, and 17 round the hall of 80-candles power. Mr. Lynd, in seconding the motion, said that he had had an opportunity of seeing different lamps tested at Birmingham, and he was in favour of Messrs. Bray's.

Extract from the *Daily Free Press*, Aberdeen, Jan. 1, 1880.

Judging of the merits of the lights as they appeared last night, on-lookers seemed to be generally of opinion that between Sugg's patent and Bray's larger light at the corner of Union Buildings, Castle Street, there was no perceptible difference in the illuminating power. When the vital question of gas consumption is taken into account, it is found that in the Castle Street lamps there is a marked difference in the quantity of gas consumed, for while 30 feet of gas are hourly burned in Sugg's Patent Lamp, only 20 feet are used by Bray's Lamp during the same period.

[**The above Lamps have Meters attached.**]

BRAY'S LANTERNS have been adopted by the Vestry of St. George, Hanover Square, London, for all the crossings and refuges of that important district, after a direct competition with the Argand system of lighting.

Also more than 50 Towns and Vestries have adopted them, after a similar competition in most cases; and many private users. In all cases they are a pronounced success.

GEORGE BRAY & CO., BLACKMAN LANE, LEEDS.

June, 1880.

F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

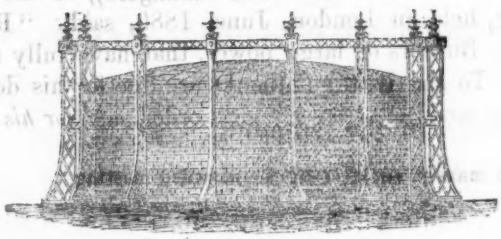
BROAD STREET, BIRMINGHAM.

ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS, WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

6, WESTMINSTER CHAMBERS, VICTORIA STREET,

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,

AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

S. OWENS & CO.,

WHITEFRIARS STREET, FLEET STREET, LONDON, E.C.,

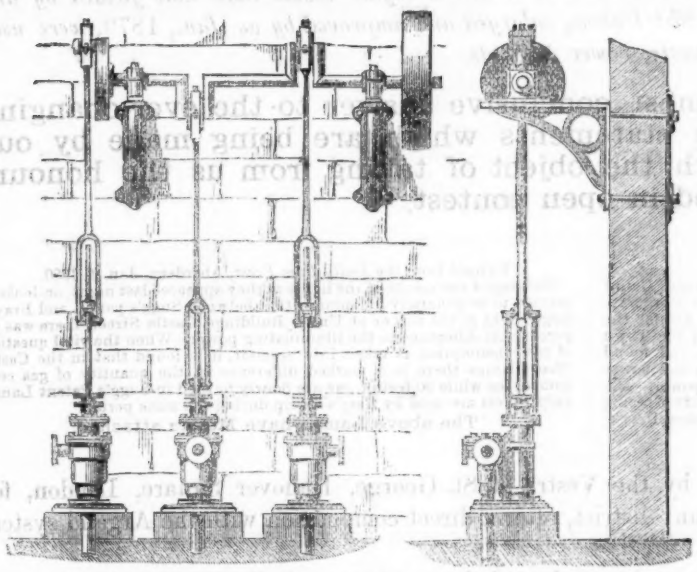
Hydraulic Engineers,

AND MANUFACTURERS OF

PUMPING MACHINERY of every Description.

SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF

BLAKE'S PATENT DIRECT-ACTING STEAM-PUMPS.



IMPROVED DOUBLE-ACTION PUMPS.

For Water. For Tar. For Ammoniacal Liquor.

This illustration shows an arrangement of three (No. 179) Improved Double-Action Pumps driven from the same crank-shaft, as frequently supplied for use in Gas and Chemical Works. The suction and discharge pipes can be arranged for drawing from and delivering in any required direction

These Pumps have been supplied to nearly all the large Gas Companies and Chemical Works, both for Pumping Water, Tar, and Ammoniacal Liquor.

GAS SYPHON PUMPS, IN COPPER OR SHEET IRON, ALWAYS IN STOCK.

Illustrated Catalogues sent post free on application.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

HENRY LYON,

MECHANICAL AND CONSULTING GAS ENGINEER,

NORWOOD, NORTHENDEN ROAD,

SALE, NEAR MANCHESTER.

ALFRED LASS, F.I.Accts.,

SPECIAL ACCOUNTANT FOR GAS AND WATER UNDERTAKINGS,

30, GRACECHURCH STREET, LONDON.

Accounts Analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially designed by Mr. Lass to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, Corporations, and Local Boards.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

THOMAS PROUD,

BROOKFIELD WORKS,

103, ICKNIELD ST., BIRMINGHAM,

MANUFACTURER OF

WOOD GRIDS

FOR

PURIFIERS AND SCRUBBERS,

AND

GENERAL STEEL AND IRON TOOLS AND MATERIAL USED IN GAS-WORKS.

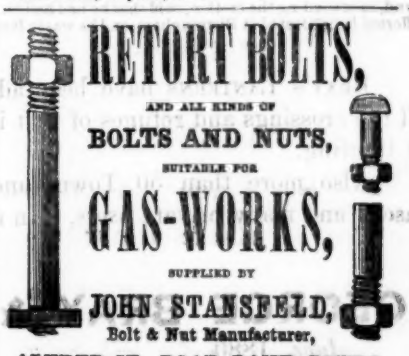
BOX'S PATENT STREET GAS-LAMP

Has the following good qualities:—

1. No putty or other material is required for glazing. Thus there is no hacking out of old putty on removal of the glass, with the *consequent damage* to the lamp frames. 2. No liability to breakage by unequal expansion of the glass caused by changes of temperature. 3. Any inexperienced workman can glaze the lamp in a few minutes. 4. The system of glazing can be applied to any existing lamp at a trifling cost. 5. It is cheap, strong, and durable. 6. The glass can be easily removed so that the frames can be thoroughly painted inside and out.

The lamp may be supplied fitted with clear opal or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing lamps to this system can be supplied at moderate prices and a small charge for royalty. Licences granted on the most reasonable terms. For further particulars apply to the Patentee, W. W. Box,

Gas-Works, Crayford, Kent.



RETORT BOLTS,

AND ALL KINDS OF

BOLTS AND NUTS,

SUITABLE FOR

GAS-WORKS,

SUPPLIED BY

JOHN STANSFELD,

Bolt & Nut Manufacturer,

ALFRED ST., BOAR LANE, LEEDS.

THE

MANN & WALKERS' PATENT SCRUBBER.

Extensive use. The successful and extensive use of the Mann and Walkers' Patent Scrubbers in all parts of the world has demonstrated their advantages, and entitled them to be received with credit and confidence. The number of them in use is about twenty times that of any other known means of purifying gas from ammonia.

Small quantity of Water required. By a very small quantity of clean water (not more than 5 or 6 gallons per ton of coals carbonized) the whole of the Ammonia contained in the Gas is completely absorbed; the Gas, after only once passing through, issuing from the Scrubber outlet completely purified from Ammonia. The Scrubber gives no appreciable back pressure.

Residual Product obtained. The Residual Product—namely, the Ammoniacal Liquor—is obtained at from 20 to 30 ounces commercial strength, which enables it, after being mixed with the weaker Liquor from the hydraulic main and condensers, to be sold to the Manufacturing Chemists, or converted into Sulphate, at the degree of strength found most profitable to the Gas Company.

Illuminating power increased. The Scrubber is a Saturator, and the Gas being soaked in this strong solution of Ammonia in the lower columns of the Scrubber, is purified from a large amount of Carbonic Acid, and its Illuminating Power is thereby increased.

Small amount of power required. The friction is so little, and the motion so slow, that the power necessary to work the Scrubber is almost inappreciable. A small gas-engine will work a pair of Scrubbers, purifying 2 million cubic feet of gas per day.

Beckton Gas-Works. There are thirty of these Patent Scrubbers in the Beckton Gas-Works, equal to purifying 30 million cubic feet per day, and the total amount of engine power necessary to work the whole 30 is not equal to that given out by one 10-horse engine.

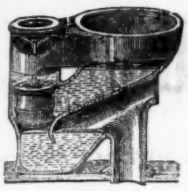
Reserve purifying power contained. There is also a most important advantage arising from the height of these Scrubbers, in the reserve force contained in them. In the event of any stoppage, the mass of soaked and wetted material would continue the purification for hours, even if the supply of water and working were stopped from any cause.

Internal Materials not changed. The changing of the soaking materials in these Scrubbers is very seldom required; they are well known to remain in action for seven years without being emptied.

Guarantee They are in all cases erected under guarantees; they easily fulfil the stipulations of any Act of Parliament, and the chemical restrictions of the Board of Trade; and in cost they are much less to a Gas Company than any other known means of purifying Gas from Ammonia.

C. & W. WALKER.

8, *Finsbury Circus, London, E.C.*



SMEATON'S TRAPLESS CLOSETS.

MESSRS. W. SMEATON & SONS,
HOT WATER AND SANITARY ENGINEERS.

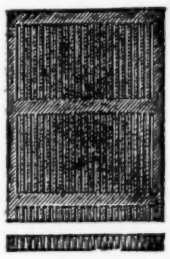
PATENTEES AND INVENTORS OF THE
TRAPLESS, THE D TRAP, AND EDDYSTONE CLOSETS.
Also the New
ECLIPSE COMBINATION CAST LEAD TRAP.

The Price will be half of the old-fashioned D Trap, it being cast all in lead, without a Joint. Send at once for an Illustrated Price List to their Wholesale and Retail Agent,

G. R. GLENIE,
WALBROOK HOUSE, 37, WALBROOK, LONDON, E.C.

A large Discount to the Trade and Shippers. Estimates Given and Contracts Taken.

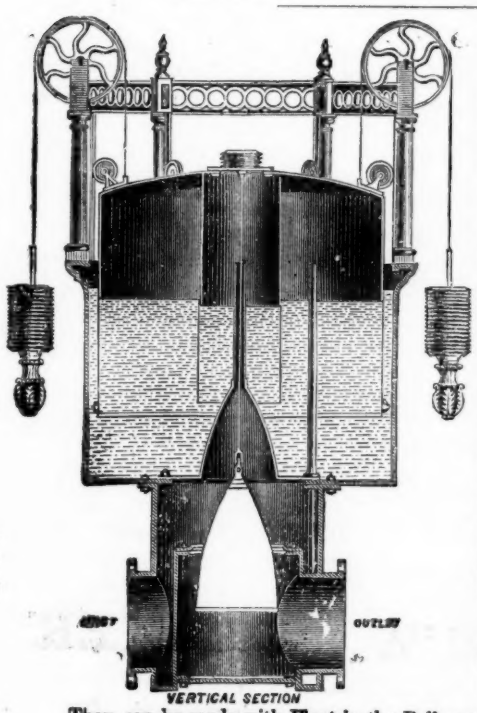
R. DEMPSTER AND SON'S



WOOD SIEVES FOR PURIFIERS,
WITH TAPER OR PARALLEL BARS,
MADE BY SPECIAL MACHINERY.
SCRUBBERS FILLED WITH BOARDS,
On our approved principle, for the extraction of Ammonia.
Prices on application. References to First-Class Engineers.
ROSE MOUNT IRON-WORKS,
ELLAND, NEAR HALIFAX.
LONDON OFFICES: 2, SUFFOLK LANE, CANNON STREET, E.C.

J. & J. BRADDOCK,
GLOBE METER-WORKS, OLDHAM,
MANUFACTURERS OF
WET AND DRY CONSUMERS GAS-METERS,
OF THE HIGHEST EXCELLENCE ONLY;
ROUND STATION-METERS,
ON CAST-IRON STANDS;
SQUARE STATION-METERS,
WITH PLANED JOINTS.

Messrs. BRADDOCK beg to submit to Gas Engineers their
PATENT COMPENSATING GAS GOVERNOR,
Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



VERTICAL SECTION

The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 30-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

C. & W. WALKER'S
WOOD PURIFIER SIEVES,
Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,
DONNINGTON, NEAR NEWPORT, SHROPSHIRE.
FINSBURY CIRCUS, LONDON.

MOBBERLEY & PERRY,
FIRE CLAY and BRICK WORKS,
STOURBRIDGE.
Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAY.
Manufacturers for Home and Export.
GAS-RETORTS, GLASS-HOUSE FURNACE,
BLAST-FURNACE, TANK BRICKS, LUMPS, TILES,
And Every Description of Best Fire-Bricks.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE
FIRE CLAY & BRICK WORKS,
STOURBRIDGE.
Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.
Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

ESTABLISHED IN 1860.
BENJAMIN CARPENTER,
THE ORIGINAL MANUFACTURER OF
THE IMPROVED
WOOD SIEVES
FOR
GAS PURIFIERS & SCRUBBERS.
PROVIDENCE WORKS,
22, HERMES STREET, PENTONVILLE ROAD,
LONDON, N.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,
Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1½ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

GEORGE'S
Patent Gas Calorigen,
A STOVE FOR
WARMING AND VENTILATING.
RECOMMENDED BY DR. RICHARDSON.
MANUFACTURERS:
J. F. FARWIG & CO.,
36, QUEEN STREET, CANNON ST., LONDON.

Gold Medal Awarded, Paris Exhibition, 1878.

THOMAS TURTON
AND SONS,
SHEAF AND SPRING WORKS,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS,
STEEL OF ALL DESCRIPTIONS,
SCREW STOCKS, TAPS, AND DIES, SPANNERS
RATCHET BRACES, LIFTING-JACKS,
ANVILS, VICES,
AND ENGINEERS TOOLS GENERALLY.
LONDON OFFICE:
96, CANNON STREET, E.C.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

196, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

HARTHILL CANNEL

Yields 14,220 cubic feet of 40·22-candle gas per ton.

THRASHBUSH CANNEL

12,580 cubic feet of 40·32-candle gas per ton, and 9 cwts. of good coke.

LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash. This cannel is almost free from sulphur.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full analyses on application at above address, or from WEDDERSPOON, FERGUSSON AND Co., 21, Lime Street, LONDON, E.C.

HEBBURN MAIN GAS COAL.

This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

For references and prices, either f. o. b. or by rail, apply to

W. RICHARDSON,

29, QUAYSIDE, NEWCASTLE-ON-TYNE.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

GAS COAL.

THE MIRFIELD COAL COMPANY are supplying GAS COAL of the best quality on trucks at their siding. This Coal contains 10 per cent. of Cannel, and, as analyzed by Mr. James Paterson, of Warrington, yields 12,500 *cubic feet of* 16·67-*candle gas, with* 1430 *lbs. of good Coke, per ton.* Ash in Coke, 1·88.

Apply to the MIRFIELD COLLIERY, Mirfield, NORMANTON. London Agent: Mr. F. J. LEE SMITH, Bromley, KENT.

GAS COAL.

THE Tawd Vale Colliery Company, Limited, are prepared to Contract for the Supply of their superior Arley and other GAS COALS, and to send samples to the order of Gas Engineers and others, or complete Analysis, on application. Shipped at Liverpool, Preston, Fleetwood, Garston, or Birkenhead.

Mr. James Paterson, C.E., F.G.S., in his analysis of T. V. Arley Coal, says: "Some parts merge into a semi-Cannel; gas per ton, 10,306 cubic feet; illuminating power, 16·90 candles; coke of high quality, 1431 lbs. per ton."

Collieries, Skelmersdale, near Ormskirk; Offices, 5, New Hall, Old Hall Street, LIVERPOOL.

BIRTLEY IRON WORKS,
CHESTER-LE-STREET,
DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Agent in London, Mr. J. MANWARING, 101 Cannon Street, E.C.

THE

SILICA FIRE-BRICK CO.,

OUGHTIBRIDGE

Near SHEFFIELD,

Manufacturers of THE ORIGINAL SILICA OR DINAS FIRE-BRICKS. Specially adapted for Gas-Retort Furnaces and for Siemens's Gas-Furnaces. Shipments promptly executed to London, Liverpool, Hull, Grimsby, &c.

FERRAND DAVIES,

148, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.,

AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL,

AND

NEWTON, CHAMBERS, & CO.'S SILKSTONE GAS COALS.

Analyses and Quotations on application.

WILSON CARTER AND PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station or for Export all kinds of Fuel for Gas purposes.

Address—CHIEF OFFICES.

TEMPLE BUILDINGS, 50, NEW STREET, BIRMINGHAM.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

35A, GREAT GEORGE STREET,

WESTMINSTER, S.W.,

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS—giving great Economy of Fuel.

STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.

FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Twenty-Eight Illustrations and Letterpress, on the Construction of Gas-Works, will be sent, post free, on receipt of 4s. in stamps To be had of the AUTHOR; or at the Office of the "JOURNAL OF GAS LIGHTING."

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,

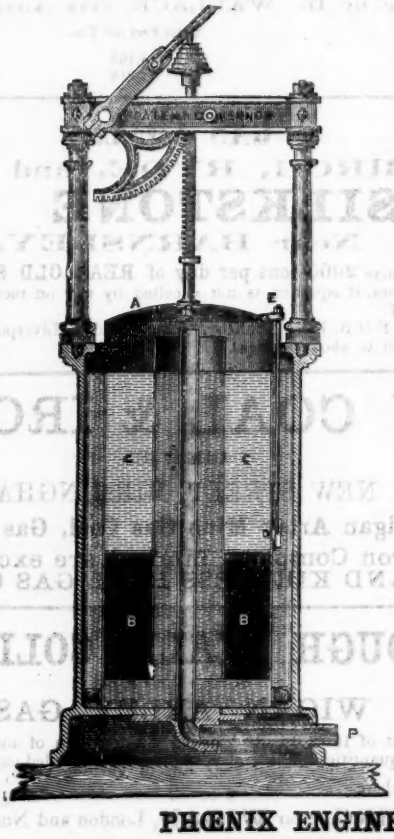
35a, GREAT GEORGE STREET, WESTMINSTER, S.W.

GEORGE WALLER & CO.,

GAS AND HYDRAULIC ENGINEERS,

Patent Compensating Steam Governor,

WITH SELF-CONTAINED WATER-BALANCE.



This is the most efficient and perfect Governor yet made to control and regulate the speed of Engines and Exhausters according to the varying make of gas, and maintain a steady gauge, whether working level or with six inches of seal.

It is the only Governor that will effectually control Condensing and Compound Engines, especially when the Exhauster is on light work, and the Engine is large.

During the drawing and charging of Retorts, the Engine requires no attention—a matter of great importance in small works.

Descriptive Circular sent on application.

They are in use at

BECKTON,
HAMPTON WICK,
DUKINFIELD,
HARTLEPOOL,
NEWCASTLE-ON-TYNE,
RAMSGATE,
SUTTON,

and about 30 other works.

G. W. and Co. make **special Steam Throttle Valves,** suitable for working with this Governor, and alter existing Throttle Valves to same plan.

See also advertisement, page 108.

PHŒNIX ENGINEERING WORKS,

Holland Street and Bear Gardens, Southwark, S.E.

HONOURABLE MENTION.

PARIS EXHIBITION, 1878.

J. E. WILLIAMS & CO.,

SOLE MANUFACTURERS OF THE

SPECIAL METALLIC OXIDE PAINT,

Largely used by Gas Companies, Corporations, Railway Companies, Ironfounders, and Machinists.

HONOURABLE MENTION.

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[*As Illustrated and Described in the* JOURNAL *for May* 4.]

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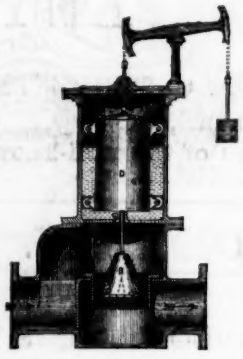

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